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RAPID ASSESSMENT REPORT FOR SITE 18 BUILDING 123 AND 19 AST 3909 ZONE G
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TETRA TECH

Rapid Assessment Report for Site 18, Building 123 and Site 19, AST 3909

Zone G
Charleston Naval Complex
North Charleston, South Carolina

Southern Division
Naval Facilities Engineering Command

Contract Number N62467-94-D-0888
Contract Task Order 0088

May 2000

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RAPID ASSESSMENT REPORT
FOR
SITE 18, BUILDING 123
And
SITE 19, AST 3909

ZONE G, CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

COMPREHENSIVE LONG-TERM
ENVIRONMENTAL ACTION NAVY (CLEAN) CONTRACT

Submitted to:
Southern Division
Naval Facilities Engineering Command
2155 Eagle Drive
North Charleston, South Carolina 29406

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CERTIFICATION PAGE

I certify that the information contained in this report and on any attachments is true, accurate, and complete to the best of my knowledge, information, and belief.

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TABLE OF CONTENTS

TABLE OF CONTENTS (Continued)

TABLES

FIGURES

APPENDICES

EXECUTIVE SUMMARY

Tetra Tech NUS, Inc. (TtNUS) has completed a Rapid Assessment (RA) for Sites 18 and 19 which includes an underground storage tank (UST) and aboveground storage tank (AST) system for Building 123 at Charleston Naval Complex (CNC) Zone G, in North Charleston, South Carolina. The UST provided heating oil to the building and the AST stored diesel fuel for the building's steam generator. The RA was performed under the direction of the South Carolina Department of Health and Environmental Control's (SCDHEC's) Rapid Assessment Plan and approval letter dated November 4, 1998.

TtNUS performed the following actions during the RA:

- Reviewed available Navy documents to identify potential sources and receptors for petroleum hydrocarbons in the vicinity, to evaluate public and private potable wells, to locate utilities line areas, to locate nearby surface water bodies, and to determine surface hydrology and drainage;
- Reviewed the previously prepared Underground Storage Tank Assessment Report for UST 123 and AST 3909 to determine boring locations and monitoring well placements;
- Conducted site survey to identify utilities and to construct a site plan;
- Performed direct push investigation, collected soil and groundwater samples for field screening of total petroleum hydrocarbons using an organic vapor analyzer;
- Collected groundwater samples from direct push borings for mobile lab screening analysis for benzene, toluene, ethyl benzene, total xylenes (BTEX), and diesel range organics;
- Installed 6 temporary piezometers;
- Installed shallow permanent monitoring wells to approximately 13 feet below land surface (bls) and one vertical delineation wells to approximately 33 feet bls;
- Collected groundwater samples from the permanent monitoring wells for laboratory analysis of analyzed for BTEX, methyl tert-butyl ether (MTBE), and naphthalene using U.S. Environrmental Protection Agency (USEPA) Method 8260 and polynuclear aromatic hydrocarbons (PAHs) using USEPA Method 8270;
- Collected soil samples for laboratory analysis of BTEX and naphthalene using USEPA Method 8260, PAHs using USEPA Method 8270, total organic carbon (TOC) using USEPA Method 415.1, total recoverable petroleum hydrocarbon (TRPH) using USEPA Method 9071, and grain size analysis using sieve and hydrometer methods; and

- Surveyed monitoring well and piezometer top of casing elevations and collected depth to groundwater measurements to evaluate the groundwater flow direction.

Conclusion

One groundwater-elevation-monitoring event was conducted at the site on September 9, 1999. Free product was detected in existing monitoring well FDS01A, where the product thickness was 3.10 feet. Free product was not detected in any of the remaining wells. One groundwater sampling event was conducted on September 9, 1999. Dissolved chemicals of concern (CoCs) were detected in the vicinity of Building 123 and AST 3909. The maximum concentrations were: benzene (32 ug/L) and naphthalene (1,400 ug/L), which are above (SCDHEC's) Risk Based Screening Levels (RBSL) for benzene and naphthalene.

Soil samples were collected between May 3 and May 13, 1999, and analyzed for BTEX and PAHs by a fix-based laboratory. Benzene and naphthalene soil concentrations were reported above SCDHEC's Risk Based Screening Levels for sandy soils. Construction worker site-specific target levels (SSTLs) were calculated to evaluate the exposure pathway for soil CoCs. The maximum concentrations of benzene (0.9 mg/kg) and naphthalene (7.25 mg/kg) in soil do not exceed the RBSLs.

The downgradient extent of hydrocarbon impact to groundwater has not been delineated. Free product was present in monitoring well FDS01A with a thickness of 3.10 feet in September 1999. Construction worker and surface water site-specific target levels (SSTLs) were calculated to evaluate the exposure pathway for groundwater CoCs. Calculated concentrations of benzene (0.313 mg/L) and naphthalene (23.35 mg/L) in groundwater in equilibrium with fuel oil exceed the site SSTLs protective of both the construction worker and the Cooper River.

Recommendation

The theoretical concentrations of benzene and naphthalene in groundwater, assuming equilibration with free product, were found to exceed the SSTLs for the construction worker and for the Cooper River. Because the SSTLs are exceeded, removal of free product will be necessary to protect the identified receptors. However, the concentrations of CoCs detected in groundwater to date indicate that once free product is removed only the concentration of naphthalene in groundwater will slightly exceed the SSTLs for the Cooper River. Therefore, following free-product removal, an Intrinsic Corrective Action is recommended for the site (pending the results of groundwater sampling after free product removal.

1.0 INTRODUCTION

Site 18 is a closed underground storage tank (UST) system which stored waste oil from an oil/water separator located adjacent to the auxillary boiler house at Building 123 at the Charleston Naval Complex (CNC), Zone G, in Charleston, South Carolina. Site 19 is a closed aboveground storage tank (AST) system which supplied fuel oil to the boilers of Building 123 at the Charleston Naval Complex (CNC), Zone G, in Charleston, South Carolina. This Rapid Assessment (RA) for the two adjoining sites was performed by Tetra Tech NUS, Inc.'s (TtNUS's) Tallahassee, Florida, office, located at 1401 Oven Park Drive, Suite 102, Tallahassee, Florida 32312 (telephone number 850-385-9899) on behalf of the U.S. Navy Southern Division (SOUTHDIV) Naval Facilities Engineering Command (NAVFAC), 2155 Eagle Drive, North Charleston, South Carolina 29406 (telephone number 843-820-7307). Authorization to conduct the RA for the site was issued by NAVFAC under Contract Task Order (CTO) 0088. The RA was performed under the direction of the South Carolina Department of Health and Environmental Control's (SCDHEC's) Rapid Assessment Plan approval letter dated November 4, 1998.

Fieldwork necessary to complete the RA for Site 18 and Site 19 was performed from April 27 to September 9, 1999, by TtNUS.

1.1 SITE DESCRIPTION

The CNC is in the city of North Charleston, on the west bank of the Cooper River in Charleston County, South Carolina, as shown on Figure 1. This installation consists of two major areas: an undeveloped dredge materials area on the east bank of the Cooper River on Daniel Island in Berkley County, and a developed area on the west bank of the Cooper River. The developed portion of the base is on the peninsula bounded on the west by the Ashley River and on the east by the Cooper River. The site is located within the developed portion of the base as shown on Figure 2.

The area surrounding CNC is "mature urban," having long been developed with commercial, industrial, and residential land use. Commercial areas are primarily west of CNC; industrial areas are primarily to the north of the base along Shipyard Creek. A site vicinity map, which exhibits adjacent properties and structures, vicinity roads, and current utilities is included as Figure 2.

Building 123 was used as a boiler house that supplied steam to ships and parts of the Naval base. It was constructed in 1977 on previously undeveloped land. UST 123 was a 1,000-gallon steel tank which stored waste oil from an oil/water separator. The UST was installed in 1977 and was an underground tank placed directly into the soil.

The UST was located on the north side of Building 123 (Figure 3). It is unknown when the UST system was last in operation [Supervisor of Ship Building, Conversion and Repair, United States Navy, Portsmouth, Virginia, Environmental Detachment Charleston (SPORTENDETCHASN), 1998].

AST 3909 was a 200,000-gallon capacity, steel fuel oil tank which supplied fuel oil to the auxillary boiler in Building 123. The AST was installed in 1964 on a concrete foundation filled with 18 inches of sand. The AST was located approximately 160 feet east of Building 123. It is unknown when the AST system was last in operation [Supervisor of Ship Building, Conversion and Repair, United States Navy, Portsmouth, Virginia, Environmental Detachment Charleston (SPORTENDETCHASN), 1998].

1.2 SITE HISTORY

In 1901, the U.S. Navy acquired 2,250 acres near Charleston to build a shipyard and the first naval officer was assigned duty in early 1902. Subsequently, buildings and a dry dock were constructed in the Naval Yard. The dry dock was completed in 1909 along with several other brick buildings and the main power plant, which is still in operation today. The first ship was placed in dry dock and work began on fleet vessels in 1910. World War I brought about an expansion of the yards, facilities, land area, and work force. The yard built two gunboats, several submarine chasers, and tugs in addition to performing repairs and other services to the fleet. In 1933, building activity had increased principally in construction of several Coast Guard tugs, a Coast Guard cutter, and a Navy gunboat, creating the need for more facilities and a much larger work force. In 1943 civilian work force peaked with almost 26,000 employees divided among three daily shifts. In 1956, construction began on piers, barracks, and buildings for mine warfare ships and personnel. Later in the decade, the facility became a major home port for combat ships and submarines of the U.S. Atlantic Fleet [Ensafe/Allan & Hoshall, Inc. (E/A&H), 1996].

In 1993, major cuts in defense spending, as a result in part to the end of the Cold War, caused CNC to be added to the list of bases scheduled for closure under the Defense Base Realignment and Closure Act (BRAC). BRAC regulates the closure and transition of property back to the community (E/A&H, 1996). With the scheduled closure of the base, operations were scaled back and environmental cleanup proceeded to make the property available for redevelopment after closure. As part of the environmental cleanup process, the UST at Building 123 was removed and a tank closure completed on June 20, 1996. The AST at Building 123 was removed and the tank closure was completed on February 6, 1998.

UST 123 and AST 3909 were removed, cleaned, and recycled as scrap metal. At the time of the UST and AST removals, no corrosion, pitting, or holes were found in the tanks. The UST and AST system piping was constructed of steel and ran from the UST and AST to Building 123. The piping from the UST and the AST to the building were removed during the closure (SPORTENDETCHASN, 1998).

During the removal of the tanks, petroleum contamination and/or odors were identified in excavated soils and in soil samples collected during the tank removal. The Underground Storage Tank Assessment Reports for UST 123 and AST 3909 are included in Appendix A.

1.3 RECEPTOR SURVEY RESULTS

A survey of the site vicinity was conducted by TtNUS personnel to identify potential receptors for petroleum hydrocarbon contamination. The site plan (Figure 2) depicts the public utilities located within 250 feet of the former Building 123 study area. Specific information concerning the depth of utilities below land surface is currently unavailable. However, according to facility personnel, utility lines are typically located approximately 2 to 6 feet below land surface (bls) (SPORTENVDETCHASN, 1999). The following utility receptors were located:

- Sanitary sewer, water utility: Sanitary sewer lines run parallel to Hobson Avenue and the shore of the Cooper River. The sanitary sewer lines servicing Building 123 run along the west side of the building with an auxillary line which exits from the north side of the building. These lines connect with the lines along Hobson Avenue and the Cooper River. The sanitary sewer lines that run along the Cooper River pass within 75 feet of the north side of AST 3909. Water lines run parallel with Hobson Avenue and along the piers extending into the Cooper River. The water lines enter Building 123 on the south and west sides of the building. The water line along the west side of Building 123 extends from the lines along Hobson Avenue to the piers. The nearest lines are the water and sanitary sewer lines which enter and exit the west side of Building 123.

- Electrical utility, gas utility, compressed air utility, saltwater utility: Subsurface electrical lines run parallel to the shore of the Cooper River, approximately 100 feet north of Building 123. The subsurface electrical line connects to overhead utility line located northeast of Building 123. No gas utilities were identified within 250 feet of UST 123. Compressed air utilities originate from primary lines which run parallel to the shore of the Cooper River, approximately 80 feet north of Building 123. Feeder lines connect this compressed air main with Building 123 along the north side of the building.

Salt water lines run parallel to the shore of the Cooper River, approximately 35 feet north of Building 123.

According to the Final RCRA Facility Investigation Report for Zone G (E/A&H, 1996) a survey of groundwater users within a 7-mile radius of CNC was conducted by the South Carolina Water Resources Commission to ascertain the extent of any shallow groundwater usage. Results of the water use investigation revealed that no drinking water wells, which utilize the shallow aquifer, are located within a 4-mile radius of CNC. Irrigation wells were not identified within 1,000 feet of the site. Numerous monitoring wells are located within 1,000 feet of the site. The nearest surface water body to UST 123 and AST 3909 is the Cooper River located approximately 150 feet to the northeast.

There are no city, county, or state zoning ordinances as the property (CNC) is currently owned by the federal government. Information concerning zoning ordinances was obtained from the SOUTHDIV Remedial Project Manager located at 2155 Eagle Drive, North Charleston, South Carolina 29406 (telephone number 843-820-7307).

1.4 REGIONAL GEOLOGY AND HYDROGEOLOGY

CNC is located in Charleston County, South Carolina, in the Lower South Carolina Coastal Plain Physiographic Province on the Cooper River side of the Charleston Peninsula. The peninsula is formed by the confluence of the Cooper and Ashley Rivers. Topography in the area is typical of the South Carolina lower coastal plain and is characterized by having low-relief plains broken by the meandering streams and rivers, flowing toward the coast past occasional marine terrace escarpments (E/A&H, 1996).

The geology of the Charleston area is typical of the southern Atlantic Coastal Plain. Cretaceous-age and younger sediments thicken seaward and are underlain by older igneous and metamorphic basement rock. Surface exposures consist of Recent or Pleistocene sands, silts, and clays of high organic content referred to as the Wando Formation (E/A&H, 1996). Underlying the Wando Formation, increasing with age, are the Oligocene-age Cooper Group and the Eocene-age Santee Limestone. The Cooper Group is comprised of the Parkers Ferry, Ashley, and Harleyville Formations. The formation of particular importance in the Cooper Group is the Ashley Formation, which was formerly referred to as the Cooper Marl in most regional geologic literature. In more recent geologic nomenclature, the name "Cooper" has been given to a group of formations including the Ashley Formation, a pale green to olive-brown, sandy phosphoric limestone or marl, which is locally muddy and/or sandy. The Ashley Formation in the vicinity of Charleston is encountered at a depth of approximately 30 to 70 feet bls.

The top of the Ashley Formation has been reported to be associated with an erosional basin and the entire Cooper Unit, including the Ashley Formation, is indicated to be approximately 300 feet thick (E/A&H, 1996).

Groundwater occurs under water table or poorly confined conditions within the recent or Pleistocene deposits overlying the Ashley Formation of the Cooper Group. Transmissivity in the Pleistocene aquifer is generally less than 1,000 feet per day and well yields are variable, ranging from 0 to 200 gallons per minute (gpm). This groundwater contains high concentrations of iron and is commonly acidic at shallow depths (E/A&H, 1996).

The Cooper Group is hydrogeologically significant mainly because of its low permeability. In most locales, its sandy, finely granular limestone produces little or no water, but instead acts as confining material causing artesian conditions in the underlying Santee Limestone. Yields from wells in the Santee are usually less than 300 gpm (E/A&H, 1996).

2.0 ASSESSMENT INFORMATION

2.1 SITE-SPECIFIC GEOLOGY AND HYDROGEOLOGY

2.1.1 Site Geology

Five direct push soil borings (CNC18-B01 through CNC18-B05) were advanced at Site 18 under the supervision of a TtNUS geologist between April 27 and April 29, 1999 (Figure 3). These borings ranged in depth from 6 to 30 feet bls and provided soil samples to characterize the subsurface lithology. On July 25, 1999, two shallow monitoring wells (CNC18-MW01 through CNC18-MW02) were installed to a depth of 12 feet bls. Soil grab samples were collected during installation to describe the subsurface lithology. From August 8 to 9, 1999, a vertical delineation monitoring well (CNC18-MW-03D) was installed to 33 feet bls. During the direct push and drilling processes, lithologic samples were collected using split-spoon samplers to characterize the subsurface lithology to a depth of 38 feet bls.

Twenty-six direct push soil borings (CNC19-B01 through CNC19-B26) were advanced at Site 19 under the supervision of a TtNUS geologist between April 27 and May 27, 1999 (Figure 3). These borings ranged in depth from 2 to 28 feet bls and provided soil samples to characterize the subsurface lithology. On June 28, 1999, five shallow monitoring wells (CNC19-MW01 through CNC19-MW05) were installed to a depth of 12.5 to 13.5 feet bls. Grab soil samples were collected during installation to describe the subsurface lithology. No vertical delineation monitoring well was installed.

Based on lithologic descriptions from the soil borings and monitoring wells, the subsurface soil generally consists of interlayers of light brown to gray sandy silt and silty sand near the surface. Dark-gray to black silty sand and clay were encountered in samples from approximately 2 to 28 feet bls (Figure 4 and Figure 5). Boring logs are presented in Appendix B.

2.1.2 Site Hydrogeology

Seven shallow water table monitoring wells, CNC18-MW01, CNC18-MW02, CNC19-MW01, CNC19-MW02, CNC19-MW03, CNC19-MW04, and CNC19-MW05, and one deep vertical delineation monitoring well, CNC18-MW03D, were installed as part of this RA investigation (Figure 3). The shallow monitoring wells were completed to a depth of 12.5 to 13.5 feet bls. Each shallow monitoring well was completed using 10 feet of 2-inch diameter, 0.01-inch machine-slotted Schedule 40 polyvinyl chloride (PVC) screen that bracketed the water table.

Monitoring well CNC18-MW03D was completed as Type III monitoring well with 6-inch-diameter PVC surface casing grouted to a depth of 24 feet bls. After the grout for the surface casing cured for 24 hours, the bore hole for CNC18-MW03D was advanced to a depth of 33 feet. A 2-inch-diameter PVC monitoring well was installed in each well with a 5-foot, 0.01-inch machine-slotted PVC screen. Well construction logs for the RA monitoring wells are presented in Appendix B. At the completion of the well installations, a South Carolina registered professional surveyor surveyed each monitoring well location and the top of casing elevation.

Three temporary, small diameter, PVC piezometers, CNC19-P02, CNC19-P03, and CNC19-P04 were installed inspect the groundwater for the presence of free product. The piezometers were constructed of 1-1/4-inch-diameter Schedule 80 PVC threaded casing and well screen. The screen section of the piezometer was installed to bracket the water table. The piezometers were completed with a 10-foot screen section installed from 2 to 10 feet bls. Water level data from the piezometers indicated a westward groundwater flow direction across the sites.

Groundwater in shallow wells at Site 18 and Site 19 was encountered at depths ranging from approximately 2.8 to 6.2 feet bls during the RA investigation. The recorded water-level data collected during the RA are presented in Table 1. Groundwater elevation measurements were recorded from the site monitoring wells on September 9, 1999. Figure 6 presents the groundwater potentiometric surface recorded during the field event on September 9, 1999. The potentiometric surface map depicts a groundwater trough extending from east to west across the site.

As part of the Final RCRA Facility Investigation Report for Zone G (E/A&H, 1996), a tidal influence investigation was conducted. The objective of the investigation was to provide long-term water level monitoring to determine the effects of the tidal fluctuation on wells and groundwater flow throughout Zone G. During the tidal study, water levels were recorded in 32 wells throughout Zone G over a period of one day. Measurements were recorded every hour using data loggers. The 1-day period spanned one high tide and one low tide cycle.

Results of the tidal survey identified the maximum fluctuation in shallow monitoring wells to be as much as 3.64 feet with a typical variation of less than 0.5-feet. Additionally, monitoring wells located closer to the tidal source were more influenced by tidal changes than wells on the peninsula. The wells located in the study area exhibited tidal fluctuations of 0.2 to 1.16 feet. The heterogeneity of the aquifer material may limit or accentuate the tidal response in some wells.

The report concluded that the minimal fluctuations in the groundwater levels were not expected to play a significant role in directing contaminant transport in any direction other than that determined by the prevailing natural groundwater gradient (E/A&H, 1996).

2.2 ASSESSMENT RESULTS

Five soil borings were completed as part of the screening portion of the soil investigation at Site 18. Five soil borings were completed to collect soil samples for analysis at a fixed base laboratory to confirm the Chemicals of Concern (CoC). Twenty-six soil borings were completed as part of the screening portion of the soil investigation at Site 19. Seven soil borings were completed to collect soil samples for analysis at a fixed base laboratory to confirm the Chemicals of Concern (CoC). The soil borings for screening evaluation were completed using a Direct Push Technology (DPT) rig. Samples were collected to evaluate subsurface soil vapors, soil contaminant concentration (via a mobile laboratory), and groundwater contaminant concentrations (via a mobile laboratory). The soil samples were collected from a maximum depth of 6 feet bls. The soil and groundwater samples collected for mobile laboratory screening were analyzed for benzene, toluene, ethylbenzene, and xylenes (BTEX), naphthalene, and diesel range organics.

Soil samples for CoC evaluation were collected on May 4, May 13, May 14, and May 17, 1999 and analyzed for BTEX and naphthalene using U.S. Environmental Protection Agency (USEPA) Method 8260B, polynuclear aromatic hydrocarbons (PAHs) and naphthalene using USEPA Method 8070C, and total recoverable petroleum hydrocarbons (TRPH) using USEPA Method 9071A. One sample from each site was collected for grain size determination using sieve and hydrometer analysis, one sample was collected for Target Analyte List (TAL) Metals, and one sample was collected for analysis of Total Combustible Organics (TCO). The sample collection was conducted in accordance with the SCDHEC guidance document Standard Limited Assessment (June 1997). Lithologic logs for each soil boring are presented in Appendix B. The soil boring locations are shown on Figure 3 and the assessment results are presented in Section 2.3.1.

Each piezometer and monitoring well was checked for free-phase floating product (free product) prior to sampling. Approximately 3.1 feet of free product was detected in existing monitoring well FDS01A on September 9, 1999. Free product was not detected in the other monitoring wells or piezometers.

A comprehensive groundwater monitoring event was conducted between August 6 and September 9, 1999. Groundwater sampling was conducted using a peristaltic pump and low flow, quiescent techniques. The monitoring wells were sampled in accordance with SCDHEC's guidance document South Carolina Risk-Based Corrective Action for Petroleum Releases (January 1998). Each well was purged of three to six well volumes or until water quality parameters of pH, temperature, and conductivity stabilized. The field data sheets are included in Appendix C. A summary of the field parameter measurements is presented in Table 2. Groundwater samples were analyzed for BTEX and MTBE using USEPA Method 8260 and PAHs using USEPA Method 8270.

Two of the groundwater samples from each site were also analyzed for the following natural attenuation parameters: dissolved oxygen, alkalinity, carbon dioxide, sulfide, ferrous iron, nitrite, manganese, nitrogen/nitrate, sulfate, and methane. Groundwater natural attenuation data are summarized on Table 3.

2.3 FIELD SCREENING ASSESSMENT

2.3.1 Soil Vapor Assessment

Five soil borings were completed to evaluate for soil vapors as part of the soil screening assessment at Site 18. Thirty-two soil borings were completed to evaluate soil vapors as part of the soil screening assessment at Site 19. Organic vapor analyzer (OVA) headspace measurements were recorded at 1-foot intervals from ground surface to the top of the water table. Table 4 summarizes the soil vapor screening results. Figure 3 presents the soil boring locations.

Soil vapor concentrations ranged from non detect to 100 parts per million (ppm) at Site 18. Soil vapor concentrations ranged from non detect to 123 ppm at Site 19. Soil samples from 25 out of the 35 total soil boring locations at both sites contained vapor concentrations less than 50 ppm. Soil samples from six soil boring locations contained vapor concentrations ranging between 50 to 100 ppm. Soil samples from four soil boring locations contained vapor concentrations ranging from 100 to 123 ppm. The highest soil vapor concentrations were detected near and at the water table at sample depths of 3 to 7 feet bls.

The soil vapor assessment was used as a screening method to assist in identifying locations for collection of soil samples and groundwater monitoring wells. Soil sample and monitoring well locations were determined, in part, based on these data.

2.3.2 Soil Mobile Laboratory Results

One soil sample was collected from each soil boring at Site 18, and one soil sample was collected from each of twenty borings at Site 19. The soil samples were analyzed in a mobile laboratory for BTEX, naphthalene, and diesel range organics using USEPA Method 8260. The soil samples were selected based on the soil vapor screening results with the additional criterion that the samples originate in the vadose zone above the water table. Table 5 presents a summary of the analytical data from the mobile laboratory.

BTEX constituents were reported below detection limits in all samples from Site 18 with the exception of 9.6 ug/L of total xylenes (CNC18-B04). BTEX constituents were reported below detection limits in all samples from Site 19 with the exception of 5.6 ug/L of total xylenes (CNC19-B08).

Naphthalene was detected in two of five samples at Site 18; the maximum concentration was 29 ug/L (CNC18-B03). Naphthalene was detected in 8 of 17 soil samples analyzed at Site 19; concentrations ranged from 27 to 1300 ug/kg with the maximum detected at CNC19-B16. Diesel range organics were not detected at Site 18; however, they were detected in 10 of 18 samples analyzed at Site 19 at a maximum concentration of 300 mg/kg (CNC19-B11). The petroleum constituents identified in the mobile laboratory samples correlate with the boring locations where the highest soil vapor concentrations were detected.

The mobile laboratory soil analysis was used as a screening method to assist in identifying locations for collection of soil samples for fixed base laboratory analysis and locations for groundwater monitoring wells. Soil sample and monitoring well locations were determined in part based on these data.

2.3.3 Groundwater Mobile Laboratory Results

Groundwater samples were collected from five soil borings at Site 18. Groundwater samples were collected from twenty soil borings at Site 19. Each groundwater sample was analyzed using a mobile laboratory for BTEX, naphthalene, and diesel range organics using USEPA Method 8260. Table 6 presents a summary of the analytical data from the mobile laboratory.

As indicated in Table 6, BTEX constituents were not detected in any of the mobile laboratory groundwater samples at Site 18. BTEX was detected in 9 of the 20 samples analyzed from Site 19. The maximum concentrations of benzene, ethylbenzene, and total xylenes were 32, 4.2, and 4.7 ug/L, respectively, were found at CNC19-B16; toluene was not detected.

Naphthalene was detected in three of five samples from Site 18 at concentrations ranging from 6.4 ppb to 23 ppb. Naphthalene was detected in 13 of 19 samples at Site 19 with concentrations ranging from 3.1 to 1900 ug/L; the highest concentrations were found at borings CNC19-B13, -B16, and B-21. Diesel range organics were detected in only one sample at Site 18 at a concentration of 0.4 mg/L. Diesel range organincs were detected in 18 of 19 samples at Site 19 with concentrations ranging from 0.1 to 27 mg/L.

The mobile laboratory groundwater analysis was used as a screening method to assist in identifying locations for permanent groundwater monitoring wells.

2.4 CHEMICALS OF CONCERN IN SOIL AND GROUNDWATER

2.4.1 Chemicals of Concern in Soil

Five subsurface soil samples were collected from the Site 18 area and seven subsurface soil samples were collected from the Site 19 area for determination of CoCs. One duplicate sample was also collected from each site. The soil boring locations are shown on Figure 3, and Table 7 summarizes the CoCs detected in the soil samples. No CoCs were detected above the laboratory reporting limits in the soil samples collected from Site 18.

BTEX could not be quantified at or below the soil leaching RBSLs in two samples due to interference from other compounds. Total xylenes were detected above the laboratory detection and reporting limits but below the soil leaching RBSLs. Benzo(b)floranthene and chrysene were detected above the laboratory detection limit but below the soil leaching RBSLs. Naphthalene was detected in excess of the soil leaching RBSL of 210 ug/kg in soil samples CNC19-B08 (7,250 ug/kg), CNC19-B09 (1,500 ug/kg), and CNC19-B10 (5,500 ug/kg). The naphthalene concentration of 200 ug/kg detected in soil sample CNC19-B11 was below the RBSL. The soil leaching RBSL for sandy soil was based on a grain size analysis completed on sample 16SLB03 indicating a silty sand soil matrix (86% sand, 8% silt, 6% clay). Soil analytical data sheets and grain size analysis reports are provided in Appendix D. Figure 7 identifies the areal distribution of benzene and Figure 8 identifies the areal distribution of naphthalene detected in site soils during soil sampling conducted for the RA.

2.4.2 Chemicals of Concern in Groundwater

Table 8 presents the analytical results for CoCs detected in the groundwater samples. Groundwater analytical data sheets for the August 6 and 10, 1999 and September 9, 1999 field events are presented in

Appendix D. Figures 9 and 10 illustrate the areal distribution of benzene and naphthalene in groundwater, respectively, for the combined August and September sampling events.

Naphthalene was the only groundwater CoC detected above laboratory reporting limits in the groundwater samples collected from Site 18. Naphthalene was detected in groundwater samples collected from CNC18-MW02 at 227 micrograms per liter (ug/l), above the RBSL of 10 ug/l.

Benzene and naphthalene constituents were the only groundwater CoCs detected above the laboratory reporting limits in the groundwater samples collected from Site 19. A benzene concentration of 15 ug/l was detected/estimated in the groundwater sample from CNC19-MW01. This concentration is above the RBSL of 5 ug/l established for benzene. Naphthalene was detected above the RBSL of 10 ug/l in groundwater samples collected from CNC19-MW01 (98 ug/l), CNC19-MW02 (14 ug/l), CNC19-MW03 (12 ug/l), and CNC19-MW04 (157 ug/l).

2.5 ANALYTICAL DATA

The analytical data from the June 1996 and February 1998 Underground Storage Tank Assessment Reports for Site 18 and Site 19 are presented in Appendix A. Soil analytical data generated during this RA are summarized in Table 7. Groundwater analytical data generated during this RA are summarized in Table 8. The soil and groundwater laboratory analytical data for this RA are included in Appendix D.

2.6 AQUIFER CHARACTERISTICS AND EVALUATION

Groundwater levels were measured from the site monitoring wells on September 9, 1999. The groundwater flow direction across the site was generally westerly, with local groundwater highs to the north and south. The distribution of CoCs in groundwater (see Figures 9 and 10) suggests that the prevailing groundwater flow direction has been north and south, possibly a result of tidal influences. The western component of the hydraulic gradient provided in the Fuel Distribution System RFI was 0.008 feet per foot (ft/ft). Based on comparison with the CNC Zone G RFI investigation data, the northerly component of the site hydraulic gradient (0.0438 ft/ft) was deemed to be too steep to represent the prevailing, long-term groundwater flow conditions.

As part of the Fuel Distribution System Contamination Assessment Report (CAR) for Area 1, rising and falling head slug tests were conducted on six shallow monitoring wells in the immediate vicinity of Site 18 and Site 19 to determine the hydraulic conductivity of the surfical aquifer (E/A&H, 1999). Slug tests were conducted by instantaneously adding (falling head) or removing (rising head) a volume (slug) of water from the well and measuring the recovering water level with a data logger. A hydraulic conductivity value was then calculated for the rising head test and for the falling head test. The average hydraulic conductivity for each well was determined by calculating the geometric mean of the rising and falling head values. Because hydraulic conductivity data are lognormally distributed, the geometric mean was determined to be the most representative measure of central tendency.

The well construction details and boring logs for each well tested during the Fuel Distribution System RCRA CAR were reviewed to determine which wells were most representative of the conditions present at Site 18 and Site 19. To make this determination the screened interval and proximity to the site were evaluated. Based on this evaluation, monitoring wells FDS01A, FDS-01C, and FDS-01D were selected as the most representative wells. These three wells are located between Building 123 and AST 3909. The geometric mean of the rising and falling head conductivities for these wells was 3.8 feet per day.

Potential movement of groundwater at the site may be described in terms of transportation by natural flow system in the saturated zone, assuming groundwater flow follows Darcy's Law. Using Darcy's Law, the average linear velocity of groundwater may be expressed as:

$$V = \left(\frac{K}{n}\right) x\, i$$

where:

V = average velocity

K = hydraulic conductivity = 3.8 ft/day

n = volumetric porosity = 0.43
(Based on Qs samples analyzed during the Zone G RCRA Facility Investigation)

i = representative hydraulic gradient measurement = 0.008 ft/ft

therefore:

$$V = \left(\frac{3.8\ \text{ft/day}}{0.43}\right) x\ 0.008\ \text{ft/ft}$$

$$V = 0.071\ \text{ft/day}$$

In summary, the seepage velocity of the surficial aquifer was calculated to be approximately 26 feet per year based on a hydraulic conductivity of 3.8 feet per day, a hydraulic gradient of 0.008 feet per foot, and a porosity of 43% for sandy soil. Aquifer characterization graphs for the referenced well slug tests are provided in Appendix E.

2.7 FATE AND TRANSPORT MODEL DESCRIPTION

The Domenico Model was the fate and transport model used to determine groundwater site-specific target levels (SSTLs) in the risk analysis. The Domenico dilution/attenuation model is presented in the SCDHEC guidance document, *South Carolina Risk-Based Corrective Action for Petroleum Releases* (SCDHEC 1998). This model is very conservative in that it assumes an infinite contaminant mass condition through which groundwater flows. The model incorporates biological decay effects through a first-order decay process; however, this mechanism was ignored because SCDHEC guidance specifies that the decay rate must be assumed to be zero if site-specific decay rates have not been determined.

The impacted groundwater source area was modeled as 50 feet (15.00 meters) wide and 6.56 feet (2.0 meters) deep; these values are conservative defaults suggested by the American Society for Testing and Materials (ASTM) Standard Guide for Risk-Based Corrective Action Applied at Petroleum Release Sites (ASTM, 1997). The maximum source concentrations are assumed to exist throughout the source area, further compounding the conservatism of the estimate. Because of the existence of free product on-site, the maximum solubility in equilibrium with fuel oil, calculated using Raoult's Law, was used for the maximum constituent concentrations. Fuel oil constituents can vary greatly but were assumed for this investigation to be similar to kerosene, which is typically 44% naphthalene (Conoco, Inc., 1996. *CONCAWE Diesel Fuel/ Kerosene*).

Site-specific data were used for saturated hydraulic conductivity, hydraulic gradient, and the average fraction of organic carbon in soil (1.34E-05 m/sec, 0.008 ft/ft, and 0.0082 g-C/g-soil, respectively). The soil bulk density (1.54 g/cm^3) and porosity (0.43 cm^3/cm^3) were determined from the CNC Zone G RFI investigation data and assumes a soil particle density of 2.7 g/cm^3.

The following estimates of dispersivity were used in the Domenico model as given in SCDHEC (1998):

Parameter	Estimate
Longitudinal Dispersivity, α_x	x/10, where x= distance between the point of exposure and the source or compliance point
Transverse Dispersivity, α_y	$\alpha_x/3$
Vertical Dispersivity, α_z	$\alpha_x/20$

2.8 PREDICTED MIGRATION AND ATTENUATION OF CHEMICALS OF CONCERN

The most recent groundwater-gauging event shows that general groundwater flow was westerly, with local groundwater highs to the north and south of the study area. Regional flow patterns indicate that groundwater flow is tidally influenced, with flow to the southwest during incoming tides and flow to the northeast during outgoing tides. The observed groundwater flow pattern was most likely the result of variations in subsurface permeability combined with changes in tidal flow. The current extents of groundwater impacts are concentrated in the vicinity of CNC18-MW02, FDS01A, CNC19-MW01, CNC19-MW-2, CNC19-MW-3, and CNC19-MW04. Well FDS01A contained free product in the latest monitoring event. Concentrations of compounds of interest in all other monitoring wells have been non-detect or less than the reporting limit and greater than the detection limit.

The Domenico model was used to predict the distance at which the leading edge of the plume is attenuated to SCDHEC RBSLs in 10 and 20 years without using degradation due to biological decay. This was done by adjusting the time to 10 years (3.15×10^{8} second) and 20 years (6.31×10^{8} second) and solving for distance (x) by trial and error. The source was assumed to be free product [i.e., the source concentration was assumed to be that of groundwater in equilibrium with fuel oil (see Section 3.1) for the entire 10- and 20- year periods]. The distance was changed separately for benzene, toluene, and naphthalene until the required distance that is necessary for the concentration to attenuate to the RBSLs was determined. Only the calculated concentrations of benzene, toluene, and naphthalene at the source (in equilibrium with free product) were greater than their respective RBSLs; therefore, these were the only chemicals for which plume distances were calculated. The model estimates that after 10 years, the concentrations of benzene, toluene, and naphthalene will be 0.005 mg/L, 1.0 mg/L, and 0.010 mg/L (RBSLs) at distances of 140 feet, 63 feet and 22 feet, respectively. Furthermore, after 20 years, the concentrations of benzene, toluene, and naphthalene are 0.005 mg/L, 1.0 mg/L, and 0.010 mg/L (RBSLs) at distances of 220 feet, 94 feet, and 43 feet, respectively.

The benzene plume bounds the limits of the toluene and naphthalene plumes also; therefore, separate figures were not generated for each constituent. The shape of the plume was estimated based on the modeling predictions and the current plume map for benzene (see Figure 9). The Domenico 10-year and 20-year simulation spreadsheets are presented in Appendix F.

3.0 TIER 2 EVALUATION

3.1 COMPARISON OF ANALYTICAL RESULTS WITH RBSLs

Soil samples were collected from May 4 through May 17, 1999. The samples were analyzed for BTEX and PAHs including naphthalene. Benzene could not be quantified at or below the RBSL in several samples due to interference from other compounds. Naphthalene was found at maximum concentrations above its RBSL for sand-rich soil less than 5 ft above groundwater. The maximum naphthalene concentration was 7,250 ug/Kg, and its RBSL is 210 ug/Kg.

Groundwater sampling was conducted on August 6 to September 9, 1999. Free product was not detected in any of the assessment wells, but was detected in existing well FDS-01A. The remaining wells were sampled and analyzed for BTEX, MTBE, and PAHs including naphthalene. Dectected concentrations of benzene (15 ug/l) and naphthalene (227 ug/l) exceeded their respective RBSLs of 5 ug/l and 10 ug/l. A comparison of soil and groundwater maximum concentrations to RBSLs is summarized in Table 9. However, because free product was detected in the existing well FDS-01A, the theoretical groundwater concentration in equilibrium with free product based on Raoult's Law (see Appendix F) was calculated for each of the potential CoCs. These calculated values were used for comparison with RBSLs and for calculation of SSTLs in the Tier 1 and Tier 2 evaluations, respectively. This analysis showed that the theoretical concentrations of benzene (313 ug/L), toluene (4,650 ug/L), and naphthalene (23,350 ug/L) exceed the groundwater RBSLs; therefore, these CoCs were carried forward into the Tier 2 evaluation. The theoretical concentrations of ethylbenzene (100 ug/L) and xylenes (794 ug/L) do not exceed the groundwater RBSLs; therefore, these CoCs were not considered further in the evaluation of groundwater.

3.2 SITE CONCEPTUAL EXPOSURE MODEL

This section focuses on the current and future land use issues concerning the site. Building 123 was used as a boiler house to supply steam to ships and parts of the Navy Base. AST 3909 supplied the fuel for the boiler. Figure 1 shows that the site is located in and surrounded by the CNC. The area surrounding CNC is "mature urban," having long been developed with commercial, industrial, and residential land use. Commercial areas are primarily west of CNC; industrial areas are primarily to the north of the base along Shipyard Creek. This facility is included in the BRAC activities; therefore, the future use of the facility is unknown but it is likely to remain a commercial/industrial use area.

The City of Charleston water treatment plants provide drinking water to the site and to the surrounding properties. The closest surface water body is the Cooper River located less than 200 feet northeast of the site. Potable wells and irrigation wells were not identified within 1,000 feet of the site (E/A&H, 1996). Numerous monitoring wells are located within 1,000 feet of the site (E/A&H, 1996). Groundwater at the site appears to be affected by tidal variations with some plume migration both to the north and to the south of well FDS01A that contains free product. The worst case condition considered in the Tier 2 evaluation (for receptor drinking groundwater) was plume migration towards the Cooper River.

3.3 EXPOSURE PATHWAY ANALYSIS

This section presents the receptor characterizations of the potentially exposed populations in the vicinity of the site and identifies the potentially complete exposure pathways for those receptors. SCDHEC requires that only those exposure pathways with CoC concentrations exceeding Tier 1 RBSL concentrations be examined in a Tier 2 Risk-Based Corrective Action Report. Tables 10 and 11 present the exposure pathway assessments for current and future land use scenarios.

3.3.1 On-Site Commercial /Industrial Worker

An on-site commercial worker is defined as an employee who works in a commercial capacity at the site. Commercial use of the site in the future is likely; therefore, an on-site commercial worker was considered as a potential receptor. Incidental ingestion and dermal contact with impacted soil are expected to be negligible for commercial workers because they are located inside a building and surficial soil was not impacted above RBSLs. Drinking water at this site is provided by the city; therefore, ingestion of groundwater is not a complete exposure pathway. The building foundation is assumed to be sufficient to prevent volatilization from both soil and groundwater into a commercial building, and there is no history of vapors in the commercial building. It is unlikely that any additional exposure pathways will exist for future on-site workers; therefore, no complete pathways exist for either current or future commercial workers.

3.3.2 On-Site Visitor

An on-site visitor is defined as any person other than a worker who might come on site. On-site visitors would have the same exposure pathways as commercial workers, but their exposure duration would be much shorter. This receptor does not have to be quantified because a potential on-site visitor's chemical intake would not drive risk or cleanup levels at the site.

3.3.3 On-Site Construction Worker

An on-site construction worker is defined as a laborer who would be involved in intrusive activities on or around the site, particularly in the area of subsurface utilities. On-site construction workers could be exposed to constituents in soil by the following pathways: inhalation of volatiles from soil, dermal contact with soil, and incidental ingestion of soil. On-site construction workers could be exposed to constituents in groundwater by the following pathways: inhalation of volatiles from groundwater, dermal contact with groundwater, and incidental ingestion of groundwater. Utilities lie in the immediate vicinity of the impacted area, and this pathway was considered for soil and groundwater exposure to a utility worker.

3.3.4 On-Site Resident

An on-site resident is defined as any person making his or her home at the site. This site is expected to remain a commercial/industrial facility; therefore, the on-site resident receptor was not considered further.

3.3.5 Off-Site Resident

An off-site resident is defined as any person making his or her home near the site. This receptor's location is either an actual current residence near the site or is a vacant lot or property on which a residence could be built. The site is located in an area that will likely remain commercial/industrial; therefore, this potential receptor was not considered further.

3.3.6 Surface Water

The Cooper River is located less than 200 feet northeast of the site. This exposure pathway was therefore considered for ingestion of surface water.

3.4 IDENTIFICATION OF DATA REQUIREMENTS

No additional data are required to calculate site specific target levels (SSTLs) for the site.

3.5 SITE-SPECIFIC TARGET LEVELS

The concentration of benzene in soil could not be quantified at or below the RBSLs for leaching to groundwater, and the concentration of naphthalene in soil exceeded the RBSLs for leaching to groundwater. In addition, the concentrations of benzene and naphthalene in groundwater exceeded RBSLs for groundwater ingestion; therefore, further evaluation was necessary.

3.5.1 SSTLs for the Construction Worker – (Soil)

The only identified future potential receptor for the soil pathway is the construction (utility) worker during digging or trenching activities. To evaluate this pathway, site soil concentrations were compared with RBSLs for ingestion or dermal contact with surficial soil. (Surficial soil was not impacted at the site; however, for the construction worker pathway, exposure to subsurface soil is evaluated as surface soil because the worker is expected to have direct contact with the subsurface soil.)

Compound Of Concern	Maximum Concentration (mg/Kg)	RBSL For Ingestion Or Dermal Contact With Soil - Commercial (mg/Kg)	Exceed RBSL
Benzene	0.9	200	No
Naphthalene	7.250	41,000	No

As shown in the above table, the maximum soil benzene and naphthalene concentrations do not exceed the applicable RBSLs, therefore, a construction/industrial worker is not considered at risk.

3.5.2 SSTLs for the Construction Worker – (Groundwater)

Groundwater RBSLs provided by SCDHEC are for ingestion only, therefore, RBSLs were calculated for the additional pathways of dermal contact, incidental ingestion, and inhalation of vapors. A target cancer risk of 1×10^{-6} and a target hazard quotient of 1 were used in the calculations. Standard defaults were used when available and applicable to a construction worker. When no standard parameters were available, conservative assumptions were used. Where possible, site-specific parameters were used for site conditions. For all pathways, the exposure frequency was assumed to be 90 days/year and the exposure duration was assumed to be 1 year. These assumptions were considered conservative based on the nature of utility work.

The dermal contact RBSLs were calculated using the procedures in Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual, Supplemental Guidance, Dermal Risk

Assessment, Interim Guidance (EPA Peer Consultation Workshop Draft 1998). Based on expected limited contact with groundwater, the event frequency was assumed to be 1 event/day and the event duration was assumed to be one hour/event. The skin surface area available for contact was 4500 cm^2, based on one-fourth the skin surface area given in the risk assessment guidance document for a swimming adult.

The incidental ingestion RBSLs were calculated using the equation given in Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual (Interim Final), EPA/540/1-89/002 (EPA 1989). An incidental ingestion rate of 0.01 L/day was assumed based on a fraction (12.5%) of the incidental ingestion rate for a wading adult (0.01 L/hr), considered for an 8-hour work day. The incidental ingestion rate for wading adults is given in Supplemental Guidance to RAGS: Region IV Bulletins, Human Health Risk Assessment (EPA Region 4 1995).

Utility lines in the area are typically 2 to 6 feet deep. The depth to groundwater at the site is shallow enough that exposure to a worker in a utility trench is considered a complete pathway. It was assumed that a construction worker might be exposed to chemicals volatilizing from standing groundwater. The inhalation RBSLs were calculated using Henry's Law:

$$RBSL_{WATER} = RBSL_{AIR}/H$$

Where H = Henry's Law constant [mg/L-air/mg/L-water]

The $RBSL_{AIR}$ for each chemical was calculated using the equation given in the American Society for Testing and Materials (ASTM) Standard Guide for Risk-Based Corrective Action Applied to Petroleum Release Sites, Designation E 1739-95e1 (1997). SCDHEC values were used for Henry's Law constants.

The minimum RBSL for the three pathways was chosen as the RBSL for the construction worker. The following table shows the calculated RBSLs for each pathway along with the selected (minimum) RBSL:

Chemical Of Concern	Dermal RBSL (mg/L)	Incidental Ingestion RBSL (mg/L)	Inhalation RBSL (mg/L)	SSTL (Min. RBSL for Construction Worker) (mg/L)	Maximum Concentration In Groundwater (mg/L)	Theoretical Source Concentration (mg/L) [(a)]	Exceeds SSTLs (Yes/No)
Benzene	0.85	68.52	0.15	**0.15**	0.003J	**0.313**	Yes
Toluene	23.98	5677.78	5.38	**5.38**	<0.005	**4.646**	No
Naphthalene	1.63	1135.56	2.63	**1.63**	0.227	**23.346**	Yes

(a) Calculated for free product using Raoult's Law (see Appendix F).
Appendix F provides the parameters and results of the RBSL and SSTL calculations.

The above comparison shows that the calculated theoretical concentrations of CoCs in groundwater, assuming equilibrium with free product, exceed the SSTLs for both benzene and naphthalene.

3.5.3 SSTLs Protective of Surface Water

SSTLs were developed which would protect the Cooper River should discharge of impacted groundwater occur. The Domenico model as described in Section 2.7 was used to determine the groundwater SSTLs for benzene, toluene, and naphthalene under steady state conditions. The fate and transport parameters used in the model are provided in Appendix F. For this analysis the groundwater flow is considered to be northeast toward the Cooper River, approximately 200 feet from the site.

Because free product is present, dissolved hydrocarbon concentrations at FDS01A were assumed to be the concentration of each compound in equilibrium with fuel oil, calculated using Raoult's Law. These concentrations were used in the Domenico model as the source concentrations. The distance from FDS01A to the Cooper River (Figure 1), which is the nearest point of exposure (other than a construction worker) was estimated at 200 feet. Using the values for the ingestion RBSLs (0.005 mg/L for benzene, 1 mg/L for toluene, and 0.01 mg/L for naphthalene) at the point of exposure (POE), the SSTLs at FDS01A were calculated and compared with the calculated source concentrations at FDS01A. The SSTLs at the compliance well (CNC19-01C) were also calculated using the groundwater ingestion RBSLs at the point of exposure.

The distance from the selected compliance well to the point of exposure was estimated to be approximately 150 feet. Based on the groundwater flow velocity, this well is located greater than 1-years travel time upgradient of the POE (i.e., the Cooper River). Groundwater SSTLs were determined to be:

Chemical Of Concern	Source SSTL (mg/L)	Compliance Point SSTL (mg/L)	Maximum Concentration In Groundwater (mg/L)	Theoretical Source Concentration (mg/L) [(a)]	Exceeds SSTLs (Yes/No)
Benzene	0.053	0.031	0.003J	**0.313**	Yes
Toluene	10.6	6.2	<0.005	**4.646**	No
Naphthalene	0.106	0.062	0.227	**23.346**	Yes

(a) Calculated for free product using Raoult's Law (see Appendix F).
Appendix F provides the parameters and results of the RBSL and SSTL calculations.

The above comparison shows that the theoretical source concentration for benzene and naphthalene, assuming equilibrium with free product, exceeds the SSTLs that are protective of the Cooper River based on ingestion of the surface water.

3.5.4 Soil Leaching Pathway

The maximum benzene concentration exceeding the RBSLs found in soil was <0.9 mg/kg. The maximum naphthalene concentration exceeding the RBSLs found in soil was 7.25 mg/kg. The SCDHEC Soil Leachability Model was used to calculate SSTLs for benzene and naphthalene. Site specific parameters were input when available, otherwise values were estimated from the charts on page C2 through C5 of the SCDHEC Risk-Based Corrective Action Guidance for Petroleum releases, January 5, 1998. The minimum calculated groundwater RBSLs for construction worker exposure (e.g., 0.15 mg/L benzene, 1.63 mg/L for naphthalene, see Section 3.5.2) were used as the groundwater target levels. The results are summarized below:

Chemical of Concern	Maximum Concentration in Soil (mg/kg)	Soil Leaching SSTL (mg/kg)	Exceeds SSTLs (Yes/No)
Benzene	<0.9	0.975	No
Naphthalene	7.250	183.89	No

As shown above, the maximum soil concentrations of benzene (<0.9 mg/kg) and naphthalene (7.25 mg/kg) found during the site assessment do not exceed the calculated SSTLs for benzene and naphthalene (0.975 mg/kg and 183.89 mg/kg, respectively). Therefore, the construction worker is not at risk if exposed to groundwater impacted by soil leaching.

3.6 RECOMMENDATIONS

The extent of hydrocarbon impact to soil has been delineated. The only potential receptor identified was the on-site construction worker who might contact subsurface soil. However, the maximum soil concentrations of all CoCs do not exceed their respective RBSLs for ingestion and dermal contact.

The northward extent of the groundwater plume has not been delineated. The modeling (see Section 2.8) indicates that if the release is less than 20 years old that the plume will not have reached the Cooper River and the river has not been impacted by CoCs presently found at the source area. No current or future drinking water receptors were identified for the site.

The theoretical concentrations of benzene and naphthalene in groundwater, assuming equilibration with free product, were found to exceed the SSTLs for the construction worker and for the Cooper River (Table 12). Because the SSTLs are exceeded, removal of free product will be necessary to protect the identified receptors. However, the concentrations of CoCs detected in groundwater to date (see Table 12) indicate that once free product is removed, only the concentration of naphthalene in groundwater will slightly exceed the SSTLs for the Cooper River which is located approximately 200 feet to the north. Therefore, following free product removal, an Intrinsic Corrective Action is recommended for the site (pending the results of groundwater sampling after free product removal).

4.0 REFERENCES

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TABLE 1

GROUNDWATER ELEVATIONS
SITE 18, BUILDING 123 and SITE 19, AST 3909
ZONE G, CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

Well #	Total Depth of Well, ft	Top of Casing Elevation, ft (MSL)	Date Measured	Depth to Water, ft (BTOC)	Depth to Product, ft (BTOC)	Product Thickness, ft	Groundwater Elevation (MSL)
FDS01A	13.0	9.75	9/9/99	9.15	6.05	3.10	3.14
FDS01B	13.0	7.69	9/9/99	4.21	ND	ND	3.48
FDS01C	13.0	9.30	9/9/99	6.00	ND	ND	3.30
FDS01D	13.0	9.46	9/9/99	6.16	ND	ND	3.30
FDS01E	13.0	6.84	9/9/99	4.68	ND	ND	2.16
CNC18-M01	12.0	7.93	9/9/99	4.68	ND	ND	3.25
CNC18-M02	12.0	6.61	9/9/99	2.77	ND	ND	3.84
CNC18-M03D	33.0	7.59	9/9/99	3.01	ND	ND	4.58
CNC19-M01	13.5	8.92	9/9/99	5.28	ND	ND	3.64
CNC19-M02	12.5	7.69	9/9/99	4.15	ND	ND	3.54
CNC19-M03	12.5	6.81	9/9/99	3.37	ND	ND	3.44
CNC19-M04	12.5	6.29	9/9/99	2.83	ND	ND	3.46
CNC19-M05	12.5	7.93	9/9/99	4.44	ND	ND	3.49

Notes:

MSL - Mean Sea Level
BTOC - Below Top of Casing
NM - Not Measured
ND- No Free Product Detected
ft - Feet

TABLE 2

GROUNDWATER FIELD MEASUREMENTS
SITE 18, BUILDING 123
ZONE G, CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

Well I.D.	Date Sampled	Purge method	Volume (gallons)	Temp. (°C)	pH	Conductivity (uMHOS/cm)
CNC18-M01	9/9/99	PP	2.1	25.5	6.87	1.51
CNC18-M02	9/9/99	PP	1.5	24.8	6.96	3.45
CNC18-M03D	9/9/99	PP	5.3	26.6	7.09	23.20
CNC18-M04	9/9/99	PP	4.5	27.0	6.89	0.72
FDS01F	9/9/99	PP	4.5	26.2	6.93	0.74

Notes:
(°C) - Degrees Celsius
PP - Peristaltic pump, low flow technique
uMHOS/cm - Micro MHOS per centimerter

TABLE 2 - CONTINUED

GROUNDWATER FIELD MEASUREMENTS
SITE 19, AST 3909
ZONE G, CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

Well I.D.	Date Sampled	Purge method	Volume (gallons)	Temp. (°C)	pH	Conductivity (uMHOS/cm)
CNC19-MW01	8/6/99	PP	3.8	27.0	6.79	2.19
CNC19-MW02	8/6/99	PP	3.9	26.2	6.99	4.48
CNC19-MW03D	9/9/99	PP	4.5	26.5	6.64	3.16
CNC19-MW04	9/9/99	PP	5.3	26.0	6.72	3.53
CNC19-MW05	9/9/99	PP	4.0	26.8	6.37	4.21
CNC19-MW06	9/9/99	PP	1.1	27.2	7.25	1.47
FDS01B	9/9/99	PP	3.0	30.6	6.85	1.04
FDS01C	9/9/99	PP	3.5	25.9	6.72	1.72
FDS01D	9/9/99	PP	3.0	27.5	6.98	2.64

Notes:

(°C) - Degrees Celsius
PP - Peristaltic pump, low flow technique
uMHOS/cm - Micro MHOS per centimerter

TABLE 3

GROUNDWATER NATURAL ATTENUATION FIELD MEASUREMENTS
SITE 18, BUILDING 123
ZONE G, CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

Well I.D.	Date Sampled	Dissolved Oxygen (mg/l)	Alkalinity (mg/l)	Carbon Dioxide (mg/l)	Sulfide (mg/l)	Ferrous Iron (mg/l)	Nitrite (mg/l)	Manganese (mg/l)	Nitrogen/ Nitrate (mg/l)*	Sulfate (mg/l)*	Methane (ug/l)*
CNC18-MW01	9/9/99	0.20	276	232	0.22	1.90	0.002	0.5	NA	NA	NA
FDS01E	9/9/99	0.30	330	192	0.40	0.04	0.013	0.1	NA	NA	NA

Notes:
mg/l - Milligrams per liter
ug/l - Micrograms per liter
E- Estimated Concentration
* Fixed base laboratory analysis
NA = Not analyzed

TABLE 3 - CONTINUED

GROUNDWATER NATURAL ATTENUATION FIELD MEASUREMENTS
SITE 19, AST 3909
ZONE G, CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

Well I.D.	Date Sampled	Dissolved Oxygen (mg/l)	Alkalinity (mg/l)	Carbon Dioxide (mg/l)	Sulfide (mg/l)	Ferrous Iron (mg/l)	Nitrite (mg/l)	Manganese (mg/l)	Nitrogen/ Nitrate (mg/l) *	Sulfate (mg/l) *	Methane (ug/l) *
CNC18-MW03	9/9/99	0.05	544	306	0.80	2.30	0.000	0.4	NA	NA	NA
FDS01D	9/9/99	0.40	550	322	0.48	0.37	0.036	0.5	NA	NA	NA

Notes:
mg/l - Milligrams per liter
ug/l - Micrograms per liter
E- Estimated Concentration
* Fixed base laboratory analysis
NA = Not analyzed

TABLE 4

SUMMARY OF OVA SOIL SCREENING RESULTS
SITE 18, BUILDING 123
ZONE G, FORMER CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

Sample Location	Sample Identification	Sample Depth (feet)	Total Organic Vapor Headspace Concentration (ppm)
CNC18-B01	18SSB0100	0	0
	18SSB0104	3	0
CNC18-B02	18SSB0201	1	2
	18SSB0202	2	2
	18SSB0203	3	2
	18SSB0204	4	2
	18SSB0205	5	7
	18SSB0206	6	7
	18SSB0207	7	5
CNC18-B03	18SSB0301	1	8
	18SSB0302	2	8
	18SSB0303	3	8
	18SSB0304	4	8
	18SSB0305	5	8
CNC18-B04	18SSB0401	1	8
	18SSB0402	2	8
	18SSB0403	3	8
CNC18-B05	18SSB0503	3	10

Notes:
OVA - organic vapor analyzer equipped with a flame ionization detector
PPM - parts per million
ND - not detected

TABLE 4 - CONTINUED

SUMMARY OF OVA SOIL SCREENING RESULTS
SITE 19, AST 3909
ZONE G, FORMER CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

Sample Location	Sample Identification	Sample Depth (feet)	Total Organic Vapor Headspace Concentration (ppm)
CNC19-B01	19SSB0101	1	Not Read
	19SSB0102	2	Refusal - concrete
CNC19-B02	19SSB0201	1	5
	19SSB0202	2	5
	19SSB0203	3	5
	19SSB0204	4	>50
	19SSB0205	5	>50
CNC19-B03	19SSB0301	1	5
	19SSB0302	2	5
	19SSB0303	3	5
	19SSB0304	4	5
	19SSB0305	5	>50
CNC19-B04	19SSB0401	1	5
	19SSB0402	2	5
	19SSB0403	3	15
	19SSB0404	4	50
	19SSB0405	5	50
CNC19-B05	19SSB0501	1	5
	19SSB0502	2	5
	19SSB0503	3	5
	19SSB0504	4	20
	19SSB0505	5	>20
CNC19-B06	19SSB0601	1	3
	19SSB0602	2	3
	19SSB0603	3	3
	19SSB0604	4	20
	19SSB0605	5	20
CNC19-B07	19SSB0701	1	3
	19SSB0702	2	3
	19SSB0703	3	3
	19SSB0704	4	3
	19SSB0705	5	3
CNC19-B08	19SSB0801	1	4
	19SSB0802	2	4
	19SSB0803	3	4
	19SSB0804	4	5
	19SSB0805	5	>30

Notes:
OVA - organic vapor analyzer equipped with a flame ionization detector
PPM - parts per million
ND - not detected

TABLE 4 - CONTINUED

SUMMARY OF OVA SOIL SCREENING RESULTS
SITE 19, AST 3909
ZONE G, FORMER CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

Sample Location	Sample Identification	Sample Depth (feet)	Total Organic Vapor Headspace Concentration (ppm)
CNC19-B09	19SSB0901	1	7
	19SSB0902	2	7
	19SSB0903	3	10
	19SSB0904	4	10
	19SSB0905	5	>50
CNC19-B10	19SSB1001	1	7
	19SSB1002	2	7
	19SSB1003	3	7
	19SSB1004	4	10
	19SSB1005	5	>15
CNC19-B11	19SSB1102	2	0
	19SSB1104	4	5
CNC19-B12	19SSB1201	1	0
	19SSB1202	2	4
	19SSB1203	3	6
	19SSB1204	4	0
CNC19-B13	19SSB1301	1	0
	19SSB1303	3	0
	19SSB1304	4	35
CNC19-B14	19SSB1401	1	0
	19SSB1402	2	0
	19SSB1403	3	11
	19SSB1404	4	10
	19SSB1405	5	70
CNC19-B15	19SSB1501	1	0
	19SSB1502	2	0
	19SSB1503	3	2
CNC19-B16	19SSB1601	1	0
	19SSB1602	2	0
	19SSB1603	3	123
	19SSB1604	4	18
CNC19-B17	19SSB1701	1	4
	19SSB1702	2	4
	19SSB1703	3	4
	19SSB1704	4	4
	19SSB1705	5	4
CNC19-B18	19SSB1801	1	1
	19SSB1802	2	4
	19SSB1803	3	4
	19SSB1804	4	4

Notes:
OVA - organic vapor analyzer equipped with a flame ionization detector
PPM - parts per million

TABLE 4 - CONTINUED

SUMMARY OF OVA SOIL SCREENING RESULTS
SITE 19, AST 3909
ZONE G, FORMER CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

ND - not detected

Sample Location	Sample Identification	Sample Depth (feet)	Total Organic Vapor Headspace Concentration (ppm)
CNC19-B19	19SSB1901	1	4
	19SSB1902	2	4
	19SSB1903	3	4
	19SSB1904	4	4
CNC19-B20	19SSB2003	3	60
	19SSB2004	4	>120
	19SSB2005	5	>50
CNC19-B21	19SSB2103	3	10
	19SSB2104	4	10
	19SSB2105	5	5
CNC19-B22	19SSB2201	1	3
	19SSB2202	2	3
	19SSB2203	3	6
	19SSB2204	4	10
CNC19-B23	19SSB2301	1	0
	19SSB2302	2	0
	19SSB2303	3	0
	19SSB2304	4	0
CNC19-B24	19SSB2401	1	0
	19SSB2402	2	0
	19SSB2403	3	0
	19SSB2404	4	0
CNC19-B25	19SSB2501	1	0
	19SSB2502	2	0
	19SSB2504	4	0
CNC19-B26	19SSB2602	2	4

Notes:
OVA - organic vapor analyzer equipped with a flame ionization detector
PPM - parts per million
ND - not detected

TABLE 5

SUMMARY OF MOBILE LABORATORY SCREENING RESULTS FOR SOIL
SITE 18, BUILDING 123
ZONE G, FORMER CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

Sample Location	Sample Identification	Sample Depth (feet)	Laboratory Screening Data (ug/kg)[1]					
			Benzene	Toluene	Ethylbenzene	Total Xylenes	Naphthalene	Diesel Range Organics (mg/kg)
CNC18-B01	18SFB01-0203	2-3	<5.0	<5.0	<5.0	<5.0	<5.0	<10
CNC18-B02	18SFB02-0405	4-5	<5.0	<5.0	<5.0	<5.0	<5.0	<10
CNC18-B03	18SFB03-0405	5-6	<5.0	<5.0	<5.0	<5.0	29	<10
CNC18-B04	18SFB04-0405	4-5	<5.0	<5.0	<5.0	9.6	13	<10
CNC18-B05	18SFB05-0809	8-9	<5.0	<5.0	<5.0	<5.0	<5.0	<10

NOTES:
[1] Laboratory screening data were analyzed using USEPA Method 8260. Compounds not detected are reported as less than the instrument detection limit.
ug/kg - micrograms per kilogram, except as noted.
mg/kg - milligrams per kilogram.

TABLE 5 - CONTINUED

SUMMARY OF MOBILE LABORATORY SCREENING RESULTS FOR SOIL
SITE 19, BUILDING 3909
ZONE G, FORMER CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

Sample Location	Sample Identification	Sample Depth (feet)	Laboratory Screening Data (ug/kg)[1]					
			Benzene	Toluene	Ethylbenzene	Total Xylenes	Naphthalene	Diesel Range Organics (mg/kg)
CNC19-B02	19SFB02-0406	5-6	<5.0	<5.0	<5.0	<5.0	<5.0	<10
CNC19-B03	19SFB03-0507	5-6	<5.0	<5.0	<5.0	<5.0	170	<10
CNC19-B04	19SFB04-0304	4-5	<5.0	<5.0	<5.0	<5.0	<5.0	<10
CNC19-B05	19SFB05-0405	5-6	<5.0	<5.0	<5.0	<5.0	<5.0	<10
CNC19-B06	19SFB06-0506	5-6	<5.0	<5.0	<5.0	<5.0	93	55
CNC19-B08	19SFB08-0506	4-5	<5.0	<5.0	<5.0	5.6	460	<10
CNC19-B08[2]	19SFB08-0506	4-5	NA	NA	NA	NA	NA	<10
CNC19-B09	19SFB09-0405	4-5	<5.0	<5.0	<5.0	<5.0	620	140
CNC19-B10	19SFB10-0405	4-5	<5.0	<5.0	<5.0	<5.0	460	44
CNC19-B11	19SFB11-0405	4-5	<5.0	<5.0	<5.0	<5.0	700	300
CNC19-B12	19SFB12-0304	3-4	<5.0	<5.0	<5.0	<5.0	<5.0	<10
CNC19-B13	19SFB13-0405	3-4	<5.0	<5.0	<5.0	<5.0	<5.0	22
CNC19-B14	19SFB14-0203	3-4	<5.0	<5.0	<5.0	<5.0	<5.0	<10
CNC19-B15	19SFB15-0203	3-4	<5.0	<5.0	<5.0	<5.0	<5.0	16
CNC19-B15[2]	19SFB15-0203	3-4	<5.0	<5.0	<5.0	<5.0	<5.0	NA
CNC19-B16	19SFB16-0203	2-3	<5.0	<5.0	<5.0	<5.0	1300	150
CNC19-B16[2]	19SFB16-0203	2-3	NA	NA	NA	NA	NA	176
CNC19-B17	19SFB17-0405	5-6	<5.0	<5.0	<5.0	<5.0	<5.0	23
CNC19-B17[2]	19SFB17-0405	5-6	NA	NA	NA	NA	NA	24
CNC19-B18	19SFB18-0304	3-4	<5.0	<5.0	<5.0	<5.0	<5.0	<10
CNC19-B18[2]	19SFB18-0304	3-4	<5.0	<5.0	<5.0	<5.0	<5.0	NA
CNC19-B19	19SFB19-0304	3-4	<5.0	<5.0	<5.0	<5.0	<5.0	<10
CNC19-B20	19SFB20-0304	3-4	<5.0	<5.0	<5.0	<5.0	27	<10
CNC19-B21	19SFB21-0304	3-4	<5.0	<5.0	<5.0	<5.0	<5.0	<10
CNC19-B22	19SFB22-0304	3-4	<5.0	<5.0	<5.0	<5.0	<5.0	<10

NOTES:
[1] Laboratory screening data were analyzed using USEPA Method 8260. Compounds not detected are reported as less than the instrument detection limit.
[2] Duplicate Sample
ug/kg - micrograms per kilogram, except as noted.
mg/kg - milligrams per kilogram.

TABLE 6

SUMMARY OF MOBILE LABORATORY SCREENING RESULTS FOR GROUNDWATER
SITE 18, BUILDING 123
ZONE G, FORMER CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

Sample Location	Sample Identification	Laboratory Screening Data (ug/kg)[1]					
		Benzene	Toluene	Ethylbenzene	Total Xylenes	Naphthalene	Diesel Rang Organics (mg/kg)
CNC18-B01	18GFB01-06	<1.0	<1.0	<1.0	<1.0	<1.0	0.1
CNC18-B02	18GFB02-12	<1.0	<1.0	<1.0	<1.0	<1.0	<0.1
CNC18-B02[2]	18GFB02-12	NA	NA	NA	NA	NA	<0.1
CNC18-B03	18GFB03-08	<1.0	<1.0	<1.0	<1.0	23	NA
CNC18-B04	18GFB04-09	<1.0	<1.0	<1.0	<1.0	10	0.4
CNC18-B05	18GFB05-12	<1.0	<1.0	<1.0	<1.0	6.4	NA

NOTES:
(1) Laboratory screening data were analyzed using USEPA Method 8260. Compounds not detected are reported as less than the instrument detection limit.
(2) Ouplicate sample
ug/kg - micrograms per kilogram, except as noted.
mg/kg - milligrams per kilogram.
NA = Not analyzed

TABLE 6 - CONTINUED

SUMMARY OF MOBILE LABORATORY SCREENING RESULTS FOR GROUNDWATER
SITE 19, BUILDING 3909
ZONE G, FORMER CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

Sample Location	Sample Identification	Laboratory Screening Data (ug/L)[1]					
		Benzene	Toluene	Ethylbenzene	Total Xylenes	Naphthalene	Diesel Range Organics (mg/L)
CNC19-B02	19GFB02-08	<1.0	<1.0	<1.0	<1.0	<1.0	0.1
CNC19-B03	19GFB03-08	<1.0	<1.0	<1.0	3.1	120	3.4
CNC19-B04	19GFB04-08	<1.0	<1.0	<1.0	<1.0	5.8	0.8
CNC19-B05	19GFB05-08	<1.0	<1.0	<1.0	<1.0	3.1	0.7
CNC19-B06	19GFB06-08	<1.0	<1.0	1.8	<1.0	14	0.5
CNC19-B07	19GFB07-08	<1.0	<1.0	<1.0	<1.0	35	0.4
CNC19-B09	19GFB09-09	<1.0	<1.0	<1.0	1.3	130	1.6
CNC19-B10	19GFB10-10	<1.0	<1.0	<1.0	<1.0	22	6.0
CNC19-B11	19GFB11-07	1.5	<1.0	<1.0	<1.0	450	1.4
CNC19-B12	19GFB12-07	<1.0	<1.0	<1.0	<1.0	<1.0	0.2
CNC19-B13	19GFB13-07	6.5	<1.0	<1.0	2.9	1900	27
CNC19-B13[2]	19GFB13-07	NA	NA	NA	NA	NA	27
CNC19-B14	19GFB14-09	<1.0	<1.0	<1.0	<1.0	15	0.8
CNC19-B14[2]	19GFB14-09	<1.0	<1.0	<1.0	<1.0	7.9	NA
CNC19-B15	19GFB15-07	<1.0	<1.0	<1.0	<1.0	<1.0	0.3
CNC19-B16	19GFB16-07	32	<1.0	4.2	4.7	1400	2.9
CNC19-B17	19GFB17-11	<1.0	<1.0	<1.0	<1.0	<1.0	0.3
CNC19-B18	19GFB18-09	<1.0	<1.0	<1.0	<1.0	6.2	0.1
CNC19-B19	19GFB19-09	<1.0	<1.0	<1.0	<1.0	<1.0	<0.1
CNC19-B20	19GFB20-09	<1.0	<1.0	<1.0	<1.0	<1.0	0.1
CNC19-B21	19GFB21-09	3.1	<1.0	<1.0	1.9	1600	5.6
CNC19-B22	19GFB22-09	1.5	<1.0	<1.0	<1.0	28	1.2
CNC19-B22[2]	19GFB22-09	3.3	<1.0	<1.0	<1.0	44	1.1

NOTES:
[1] Laboratory screening data were analyzed using USEPA Method 8260. Compounds not detected are reported as less than the instrument detection limit.
[2] Duplicate Sample
ug/L - micrograms per liter, except as noted.
mg/L - milligrams per liter.
NA = Not analyzed.

TABLE 7

SUMMARY OF FIXED-BASE LABORATORY ANALYTICAL RESULTS FOR CHEMICALS OF CONCERN IN SOIL
SITE 18, BUILDING 123
ZONE G, CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

Soil Boring / Sample No.	Sample Date	Benzene (ug/kg)	Toluene (ug/kg)	Ethyl-benzene (ug/kg)	Xylenes (total) (ug/kg)	Benzo(a) anthracene (ug/kg)	Benzo(b) fluoranthene (ug/kg)	Benzo(k) fluoranthene (ug/kg)	Chrysene (ug/kg)	Dibenzo(a,h) anthracene (ug/kg)	Naphthalene (ug/kg)
RBSL [1]		5	1622	1260	42471	73084	29097	231109	12998	87866	210
CNC18-B01 / 18SLB010203	14-May-99	< 6	< 6	< 6	< 6	< 400	< 400	< 400	< 400	< 400	< 6
CNC18-B02 / 18SLB020405	14-May-99	< 6	< 6	< 6	< 6	< 460	< 460	< 460	< 460	< 460	< 6
CNC18-B03 / 18SLB030405	4-May-99	< 6	< 6	< 6	< 6	< 360	< 360	< 360	< 360	< 360	5 [J]
CNC18-B03[3] / 18SLB030506D	17-May-99	< 7	< 7	< 7	4 [J]	< 400	< 400	< 400	< 400	< 400	3 [J]
CNC18-B04 / 18SLB040405	4-May-99	< 6	< 6	< 6	< 6	< 360	< 360	< 360	< 360	< 360	< 6
CNC18-B05 / 18SLB050406	14-May-99	< 10	< 10	< 10	< 10	< 530	< 530	< 530	< 530	< 530	< 10
CNC18-TL[2] / 1801TL00103	13-May-99	< 5	< 5	< 5	< 5	NA	NA	NA	NA	NA	< 5
CNC18-TL[2] / 1802TL00201	13-May-99	< 5	< 5	< 5	< 5	NA	NA	NA	NA	NA	< 5

All concentrations are in micrograms per kilograms (ug/kg).
NA - Not analyzed
(1) South Carolina Department of Health and Environmental Control Risk Based Screening Levels for sandy soils; depth to groundwater less than 5 feet.
(2) Trip blank
(3) Duplicate sample
(J) Indicates the presence of an analyte at a concentration less than the reporting limit and greater than the detection limit.

TABLE 7 - CONTINUED

SUMMARY OF FIXED-BASE LABORATORY ANALYTICAL RESULTS FOR CHEMICALS OF CONCERN IN SOIL
SITE 19, AST 3909
ZONE G, CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

Soil Boring / Sample No.	Sample Date	Benzene (ug/kg)	Toluene (ug/kg)	Ethyl-benzene (ug/kg)	Xylenes (total) (ug/kg)	Benzo(a) anthracene (ug/kg)	Benzo(b) fluoranthene (ug/kg)	Benzo(k) fluoranthene (ug/kg)	Chrysene (ug/kg)	Dibenzo(a,h) anthracene (ug/kg)	Naphthalene (ug/kg)
RBSL [(1)]		5	1622	1260	42471	73084	29097	231109	12998	87866	210
CNC19-B03 / 19SLB030506	14-May-99	< 6	< 6	< 6	< 6	< 530	< 530	< 530	< 530	< 530	< 6
CNC19-B06 / 19SLB060506	14-May-99	< 6	< 6	< 6	< 6	< 430	< 430	< 430	< 430	< 430	< 6
CNC19-B08 / 19SLB080405	14-May-99	< 6	< 6	56	92	< 4600	< 4600	< 4600	< 4600	< 4600	7250 [(J)]
CNC19-B09[(3)] / 19SLB090405	14-May-99	< 6	< 6	< 6	< 6	< 500	< 500	< 500	< 500	< 500	660
CNC19-B09 / 19SLB090405D	14-May-99	< 900	< 900	< 900	< 900	< 500	300 [(J)]	< 500	260 [(J)]	< 500	1500
CNC19-B10 / 19SLB100405	4-May-99	< 850	< 850	< 850	< 850	< 530	< 530	< 530	< 530	< 530	5500
CNC19-B11 / 19SLB110405	4-May-99	< 6	< 6	< 6	6 [(J)]	< 400	< 400	< 400	< 400	< 400	200 [(J)]
CNC19-B16 / 19SLB160203	14-May-99	< 7	< 7	< 7	< 7	< 460	< 460	< 460	< 460	< 460	5 [(J)]

All concentrations are in micrograms per kilograms (ug/kg).

NA - Not analyzed

[(1)] South Carolina Department of Health and Environmental Control Risk Based Screening Levels for sandy soils; depth to groundwater less than 5 feet.

[(2)] Trip blank

[(3)] Duplicate sample

[(J)] Indicates the presence of an analyte at a concentration less than the reporting limit and greater than the detection limit.

TABLE 7- CONTINUED

SUMMARY OF FIXED-BASE LABORATORY ANALYTICAL RESULTS FOR CHEMICALS OF CONCERN IN SOIL
SITE 19, AST 3909
ZONE G, CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

Soil Boring / Sample No.	Sample Date	Benzene (ug/kg)	Toluene (ug/kg)	Ethyl-benzene (ug/kg)	Xylenes (total) (ug/kg)	Benzo(a) anthracene (ug/kg)	Benzo(b) fluoranthene (ug/kg)	Benzo(k) fluoranthene (ug/kg)	Chrysene (ug/kg)	Dibenzo(a,h) anthracene (ug/kg)	Naphthalene (ug/kg)
RBSL (1)		5	1622	1260	42471	73084	29097	231109	12998	87866	210
CNC19-TL(2) / 19TL00101	3-May-99	< 5	< 5	< 5	< 5	NA	NA	NA	NA	NA	< 5
CNC19-TL(2) / 1902TL00201	13-May-99	< 5	< 5	< 5	< 5	NA	NA	NA	NA	NA	< 5

All concentrations are in micrograms per kilograms (ug/kg).
NA - Not analyzed
(1) South Carolina Department of Health and Environmental Control Risk Based Screening Levels for sandy soils; depth to groundwater less than 5 feet.
(2) Trip blank
(3) Duplicate sample
(J) Indicates the presence of an analyte at a concentration less than the reporting limit and greater than the detection limit.

TABLE 8

SUMMARY OF FIXED-BASE LABORATORY ANALYTICAL RESULTS FOR CHEMICALS OF CONCERN IN GROUNDWATER
SITE 18, BLDG 123 and AST 3909
ZONE G, CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

Monitoring Well/ Sample No.	Sample Date	Benzene (ug/L)	Ethyl-benzene (ug/L)	Toluene (ug/L)	Xylenes (total) (ug/L)	Naphthalene (ug/L)	Benzo(a) anthracene (ug/L)	Benzo(b) fluoranthene (ug/L)	Benzo(k) fluoranthene (ug/L)	Chrysene (ug/L)	dibenzo(a,h) anthracene (ug/L)	MTBE (ug/L)
RBSL[1]		5	700	1000	10000	10 [2]	10 [2]	10 [2]	10 [2]	10 [2]	10 [2]	40
CNC18M-01 / 18GLM0101	9-Sep-99	< 5	< 5	< 5	< 5	< 5	< 10	< 10	< 10	< 10	< 10	< 5
CNC18M-02 / 18GLM0201	9-Sep-99	3 [J]	< 5	< 5	4 [J]	137	< 10	< 10	< 10	< 10	< 10	< 5
CNC18M-02 / 18GLM0201D	9-Sep-99	< 5	< 5	< 5	3 [J]	227	< 10	< 10	< 10	< 10	< 10	< 5
CNC18O-1E / 18GLO1E01	9-Sep-99	< 5	< 5	< 5	< 5	< 5	< 10	< 10	< 10	< 10	< 10	< 5
CNC18O-1F / 18GLO1F01	9-Sep-99	< 5	< 5	< 5	< 5	< 5	< 10	< 10	< 10	< 10	< 10	< 5
CNC18M-03 / 18GLM03D01	9-Sep-99	< 5	< 5	< 5	< 5	< 5	< 10	< 10	< 10	< 10	< 10	< 5
CNC18TL[3] / 18TL00101	9-Sep-99	< 5	< 5	< 5	< 5	< 5	NA	NA	NA	NA	NA	< 5

All concentrations are in ug/L.
NA - Not analyzed
[1] South Carolina Department of Health and Environmental Control Risk Based Screening Levels for ground water.
[2] The Risk based screening level for individual PAH CoC is 10 ug/l or 25 ug/l for total PAHs.
[3] Trip blank
[J] Indicates presence of analyte at a concentration less than the reporting limit and greater than the detection limit.

TABLE 8 - CONTINUED

SUMMARY OF FIXED-BASE LABORATORY ANALYTICAL RESULTS FOR CHEMICALS OF CONCERN IN GROUNDWATER
SITE 18, BLDG 123 and AST 3909
ZONE G, CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

Monitoring Well/ Sample No.	Sample Date	Lead (ug/L)	Arsenic (ug/L)	Barium (ug/L)	Cadmium (ug/L)	Total Chromium (ug/L)	Mercury (ug/L)	Selenium (ug/L)	Silver (ug/L)
RBSL(1)		15	50	2000	5	100	2	50	5
CNC18M-01 / 18GLM0101	9-Sep-99	< 1.2	< 2.07	114	< 1.94	< 4.31	< 0.02	< 2.57	< 2.54
CNC18M-02 / 18GLM0201	9-Sep-99	< 1.7	< 3.6	18.8	< 1.94	< 4.31	< 0.02	< 2.57	< 2.54
CNC18M-02 / 18GLM0201D	9-Sep-99	< 1.09	< 2.07	27.3	< 1.94	< 4.31	< 0.02	< 2.57	< 2.54
CNC18M-03 / 18GLM03D01	9-Sep-99	< 3.27	< 6.21	58.4	< 1.94	< 4.31	< 0.02	< 7.71	< 2.54
CNC18O-1F / 18GLO1F01	9-Sep-99	< 1.09	20.3	59.4	< 1.94	< 4.31	< 0.02	< 2.57	< 2.54

All concentrations are in ug/L.

NA - Not analyzed

(1) South Carolina Department of Health and Environmental Control Risk Based Screening Levels for ground water.

TABLE 8 - CONTINUED

SUMMARY OF FIXED-BASE LABORATORY ANALYTICAL RESULTS FOR CHEMICALS OF CONCERN IN GROUNDWATER
SITE 19, AST 3909
ZONE G, CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

Monitoring Well/ Sample No.	Sample Date	Benzene (ug/L)	Ethyl-benzene (ug/L)	Toluene (ug/L)	Xylenes (total) (ug/L)	Naphthalene (ug/L)	Benzo(a) anthracene (ug/L)	Benzo(b) fluoranthene (ug/L)	Benzo(k) fluoranthene (ug/L)	Chrysene (ug/L)	dibenzo(a,h) anthracene (ug/L)	MTBE (ug/L)
RBSL(1)		5	700	1000	10000	10 (2)	10 (2)	10 (2)	10 (2)	10 (2)	10 (2)	40
CNC19M-01 / 19GLM0101	6-Aug-99	15	< 5	< 5	< 5	98	< 10	< 10	< 10	< 10	< 10	< 5
CNC19O-1B / 19GLO1B01	9-Sep-99	< 5	< 5	< 5	< 5	< 5	< 10	< 10	< 10	< 10	< 10	< 5
CNC19O-1D / 19GLO1D01	9-Sep-99	< 5	< 5	< 5	< 5	< 5	< 10	< 10	< 10	< 10	< 10	< 5
CNC19O-1C / 19GLO1C01	9-Sep-99	< 5	< 5	< 5	< 5	< 5	< 10	< 10	< 10	< 10	< 10	< 5
CNC19M-02 / 19GLM0201	6-Aug-99	< 5	< 5	< 5	< 5	14	< 10	< 10	< 10	< 10	< 10	< 5
CNC19M-03 / 19GLM0301	9-Sep-99	< 5	< 5	< 5	< 5	12	< 10	< 10	< 10	< 10	< 10	< 5
CNC19M-04 / 19GLM0401	6-Aug-99	4 (J)	< 5	< 5	4 (J)	157	< 10	< 10	< 10	< 10	< 10	< 5
CNC19M-05 / 19GLM0501	10-Aug-99	< 5	< 5	< 5	< 5	< 5	< 10	< 10	< 10	< 10	< 10	< 5
CNC19M-06 / 19GLM0601	9-Sep-99	< 5	< 5	< 5	< 5	< 5	< 10	< 10	< 10	< 10	< 10	< 5

All concentrations are in ug/L.

NA - Not analyzed

(1) South Carolina Department of Health and Environmental Control Risk Based Screening Levels for ground water.

(2) The Risk based screening level for individual PAH CoC is 10 ug/l or 25 ug/l for total PAHs.

(3) Trip blank

(J) Indicates presence of analyte at a concentration less than the reporting limit and greater than the detection limit.

TABLE 9

COMPARISON OF MAXIMUM CONCENTRATIONS TO RBSLs
SITE 18, UST 123 and Site 19, AST 3909
ZONE G, CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

Chemical of Concern	Maximum Concentration in Soil (mg/kg)	Soil RBSLs (mg/kg)[(a)]	Maximum Concentration in GW (mg/L)	Tier 1 GW RBSLs (mg/L)[(b)]	GW RBSLs Protective of On-Site Construction Worker[(c)]
Benzene	**<0.9**	0.005	**0.31[(d)]**	0.005	0.15
Toluene	<0.9	1.622	**4.65[(d)]**	1	5.38
Ethybenzene	<0.9	1.260	0.1[(d)]	0.7	6.05
Xylenes	<0.9	42.471	0.79[(d)]	10	102.33
Benzo(a)anthracene	<4.6	73.084	-	0.010	-
Benzo(b)fluoranthene	<4.6	29.097	-	0.010	-
Benzo(k)fluoranthene	<4.6	231.109	-	0.010	-
Chyrsene	<4.7	12.998	-	0.010	-
Dibenzo(a,h)anthracene	<4.6	87.866	-	0.010	-
Naphthalene	**7.25**	0.21	**23.35[(d)]**	0.010	1.63

(a) - From Risk-Based Corrective Action for Petroleum Releases, Table B4, Sandy Soil, Depth to GW - <5 ft, SCDHEC RBCA Guidelines, 1998.

(b) - From Risk-Based Corrective Action for Petroleum Releases, Table B1, SCDHEC RBCA Guidelines, 1998.

(c) - Calculated for dermal, incidental ingestion, and inhalation routes for the on-site construction worker (see Section 3.5.1 of the text and Appendix H).

(d) - Groundwater concentration in equilbrium with free product as calculated using Raoult's Law (see Appendix F).

GW - Groundwater

RBSLs - Risk Based Screening Levels

ND - Not detected

NA - Not analyzed

Bold value indicates the concentration exceeded one of the RBSLs.

TABLE 10

EXPOSURE PATHWAY ASSESSMENT - CURRENT LAND USE
SITE 18, UST 123 and Site 19, AST 3909
ZONE G, CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

Media	Exposure Route	Pathway Selected for Evaluation? (Yes or No)	Exposure point or Reason for Non-Selection	Data Requirements (If pathway selected)
Air	Inhalation Explosion Hazard	No No	No volatilization to enclosed space. No explosion hazard.	
Groundwater	Ingestion Dermal contact Inhalation	No No No	No water supply well downgradient or residential basements.	
Surface Water	Ingestion Dermal contact Inhalation	No No No	Cooper River 200 ft downgradient	No additional data required
Surficial Soil	Ingestion Dermal contact Inhalation	No No No	No impacted surface soil	
Subsurface Soil	Ingestion Dermal contact Inhalation	No No No	No subsurface soil with BTEX or PAHs including naphthalene above RBSLs	

TABLE 11

EXPOSURE PATHWAY ASSESSMENT - FUTURE LAND USE
SITE 18, UST 123 and Site 19, AST 3909
ZONE G, CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

Media	Exposure Route	Pathway Selected for Evaluation? (Yes or No)	Exposure point or Reason for Non-Selection	Data Requirements (If pathway selected)
Air	Inhalation Explosion Hazard	No No	No volatilization to enclosed space. No explosion hazard.	
Groundwater	Ingestion Dermal contact Inhalation	Yes Yes Yes	Future use of property expected to be industrial or commercial. Water line within 5 ft of free product plume; therefore, construction worker exposure possible.	
Surface Water	Ingestion Dermal contact Inhalation	Yes No No	Cooper River 200 ft downgradient	No additional data required
Surficial Soil	Ingestion Dermal contact Inhalation	No No No	No impacted surface soil	
Subsurface Soil	Ingestion Dermal contact Inhalation	Yes Yes No	Construction worker expsoed to soils during digging/trenching. Inhalation not considered due to volatile loss during digging; no confined space entry; and low volatility of naphthalene	No additional data required

TABLE 12

COMPARISON OF MAXIMUM GROUNDWATER CONCENTRATIONS TO SSTLs
SITE 18, UST 123 and Site 19, AST 3909
ZONE G, CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

Chemical of Concern	Thoeretical Source Area Concentration (mg/L) [a]	Maximum Concentration Detected in Groundwater (mg/L)	SSTLs Protective of Surface Water (Cooper River)		SSTLs Protective of Construction Workers	Minimum On-Site SSTLs[b]
			$SSTL_{SOURCE}$ (mg/L)	$SSTL_{COMP}$ (mg/L)	$SSTL_{SOURCE}$ (mg/L)	(mg/L)
Benzene	**0.31**	0.003	0.053	0.031	0.15	0.053
Toluene	4.65	<0.005	10.617	6.228	5.38	5.38
Naphthalene	**23.35**	**0.227**	0.106	0.062	1.63	0.106

(a) Concentration based on equilibrium of free product with groundwater
mg/L - milligrams per liter
Bold value indicates the concentration exceeded the SSTL.

(b) The minimum on-site SSTLs are chosen as those SSTLs protective of both surface water (the Cooper River) and the on-site construction worker.

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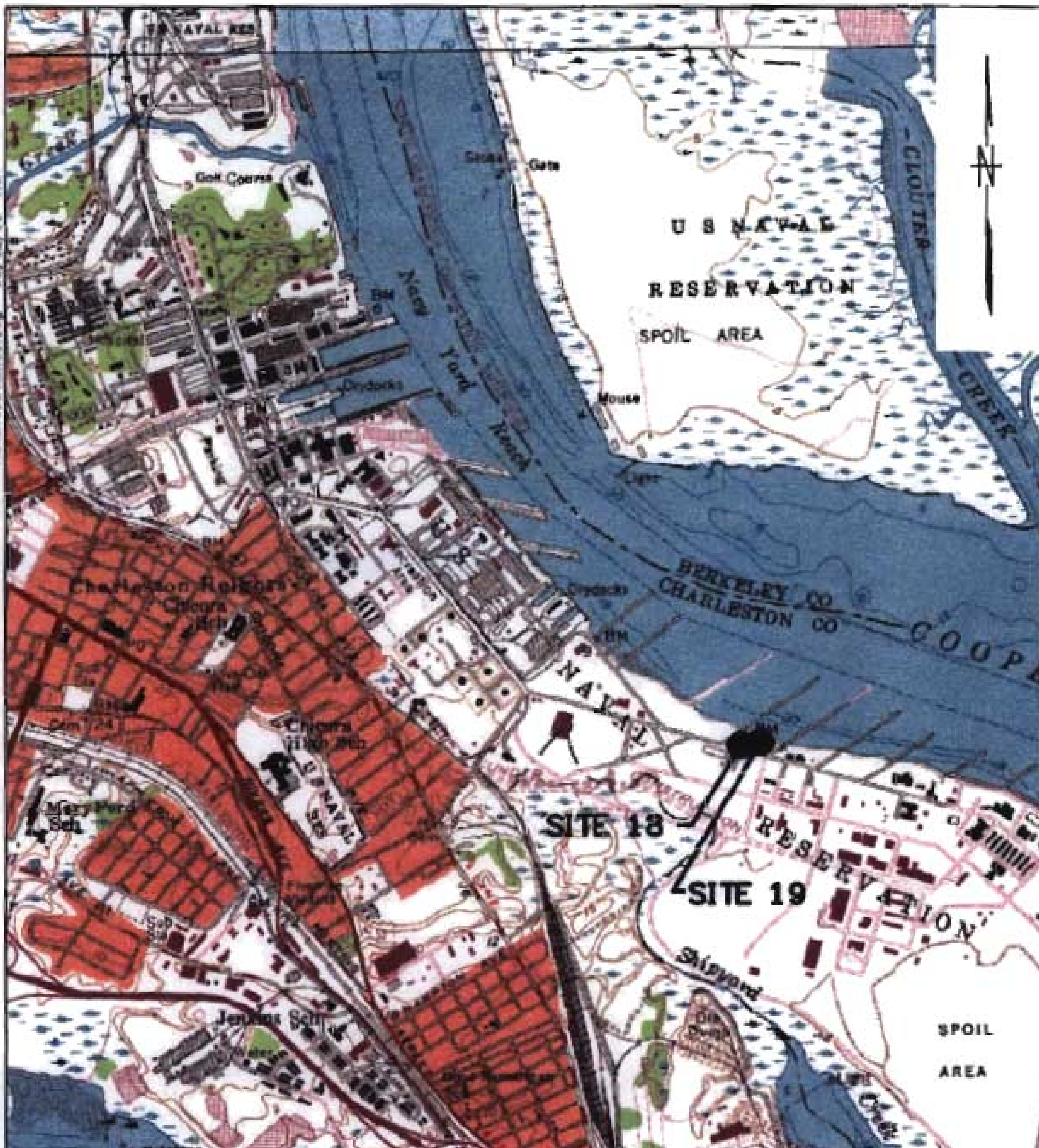
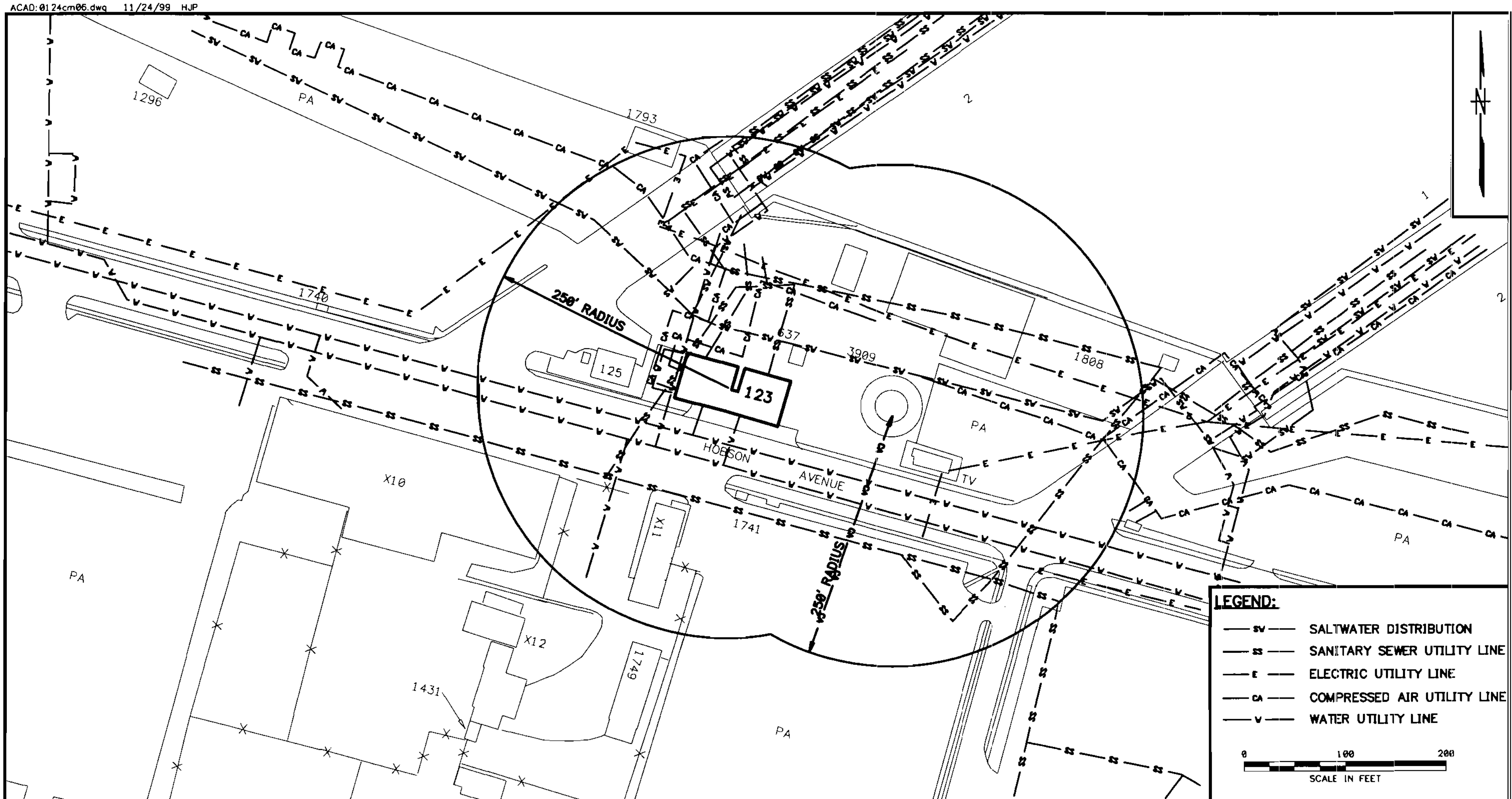


SOURCE: QUADRANGLE MAP SOUTH CAROLINA, REVISED 1979
QUADRANGLE MAP NORTH CHARLESTON REVISED, 1979

0 2000 4000
SCALE IN FEET

DRAWN BY HJP DATE 8/20/99	SITE LOCATION MAP SITE 18, BUILDING 123 AND SITE 19 AST 3909 ZONE G, CHARLESTON NAVAL COMPLEX NORTH CHARLESTON, SOUTH CAROLINA	CONTRACT NO. N0124
CHECKED BY DATE		APPROVED BY DATE
COST/SCHED-AREA		APPROVED BY DATE
SCALE AS NOTED		DRAWING NO. FIGURE 1 REV. 0

FORM CADD NO. SDIV_AV.DWG - REV 0 - 1/20/98



NO.	DATE	REVISIONS	BY	CHKD	APPD	REFERENCES

DRAWN BY HJP DATE 8/18/99

CHECKED BY DATE

COST/SCHED-AREA

SCALE AS NOTED

SITE VICINITY MAP
SITE 18, BUILDING 123
ZONE G, CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

CONTRACT NO. 0124

APPROVED BY DATE

APPROVED BY DATE

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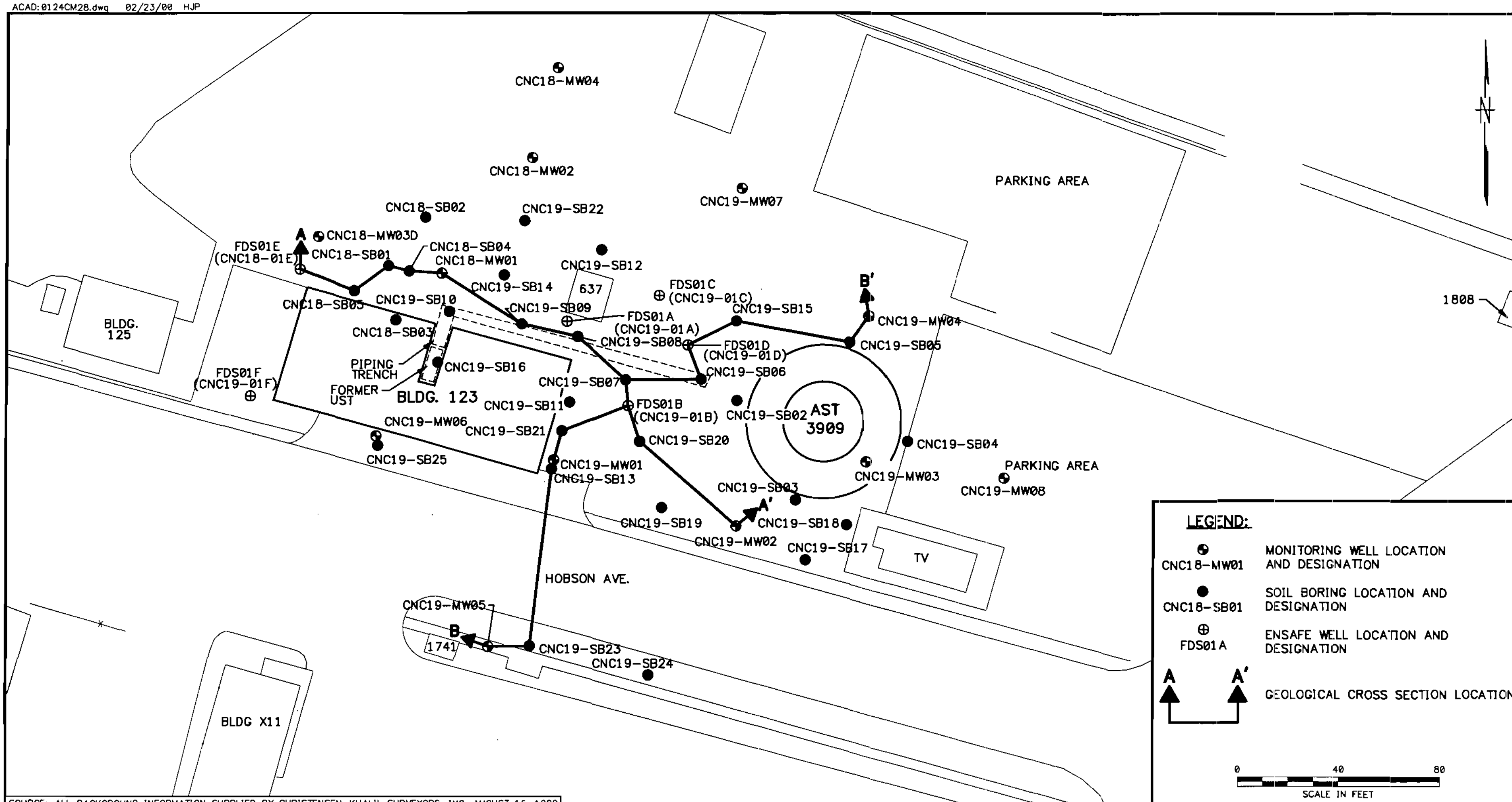

SOURCE: ALL BACKGROUND INFORMATION SUPPLIED BY CHRISTENSEN-KHALIL SURVEYORS, INC. AUGUST 16, 1999

NO.	DATE	REVISIONS	BY	CHKD	APPD	REFERENCES

DRAWN BY MF DATE 10/25/99

CHECKED BY DATE

COST/SCHED-AREA

SCALE AS NOTED

SITE PLAN AND SAMPLING LOCATIONS
SITE 18 BUILDING 123 AND
SITE 19 AST 3909
ZONE G, CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

CONTRACT NO. 0124

APPROVED BY DATE

APPROVED BY DATE

DRAWING NO. FIGURE 3

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FORM CADD NO. SDIV_BH.DWG - REV 0 - 1/20/98

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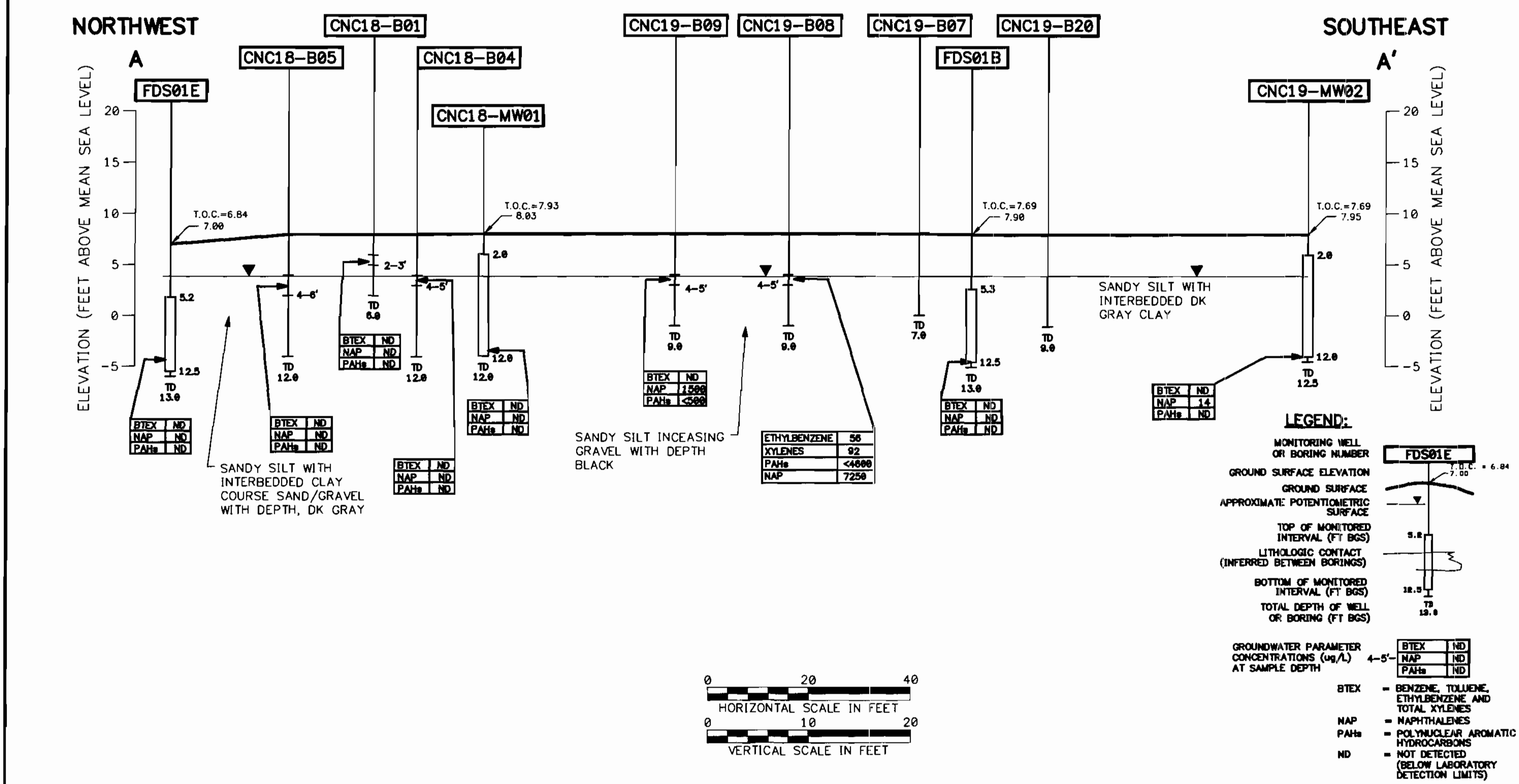

NO.	DATE	REVISIONS	BY	CHKD	APPD	REFERENCES

DRAWN BY HJP DATE 11/15/99
CHECKED BY DATE
COST/SCHED-AREA
SCALE AS NOTED

GEOLOGIC CROSS SECTION A-A'
SITE 18, BUILDING 123 AND
SITE 19 AST 3909
ZONE G, CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

CONTRACT NO. 0124
APPROVED BY DATE
APPROVED BY DATE
DRAWING NO. FIGURE 4 REV. 0

FORM CADD NO. SDIV_BH.DWG - REV 0 - 1/20/98

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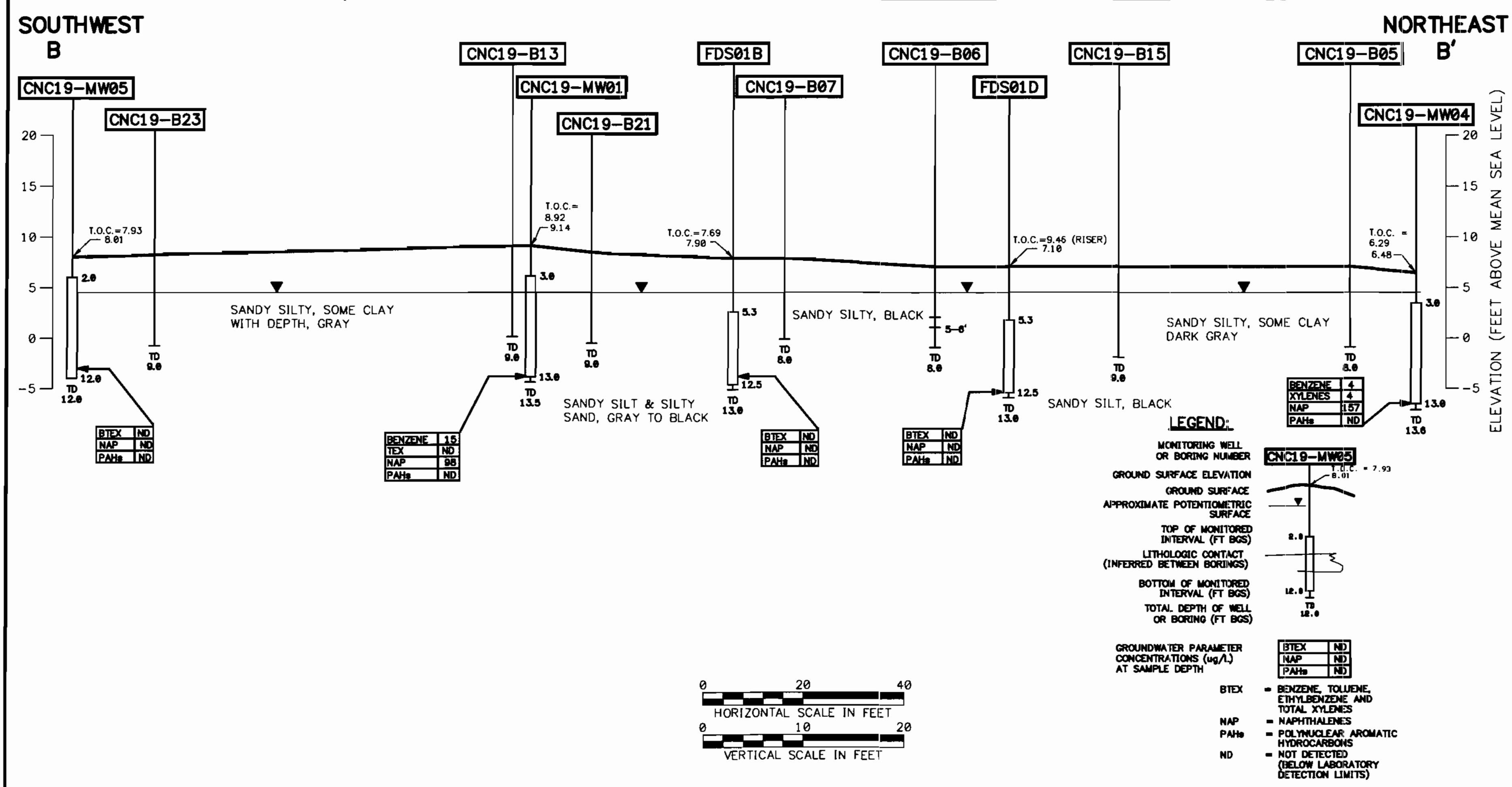

NO.	DATE	REVISIONS	BY	CHKD	APPD	REFERENCES

DRAWN BY: HJP DATE: 11/15/99

CHECKED BY / DATE

COST/SCHED-AREA

SCALE: AS NOTED

DEPARTMENT OF THE NAVY — SOUTHERN DIV FACILITIES ENGINEERING COMMAND

GEOLOGIC CROSS SECTION B-B'
SITE 18, BUILDING 123 AND
SITE 19 AST 3009
ZONE G, CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

CONTRACT NO. 0124

APPROVED BY / DATE

APPROVED BY / DATE

DRAWING NO. FIGURE 5 REV. 0

FORM CADD NO. SDIV_BH.DWG - REV 0 - 1/20/98

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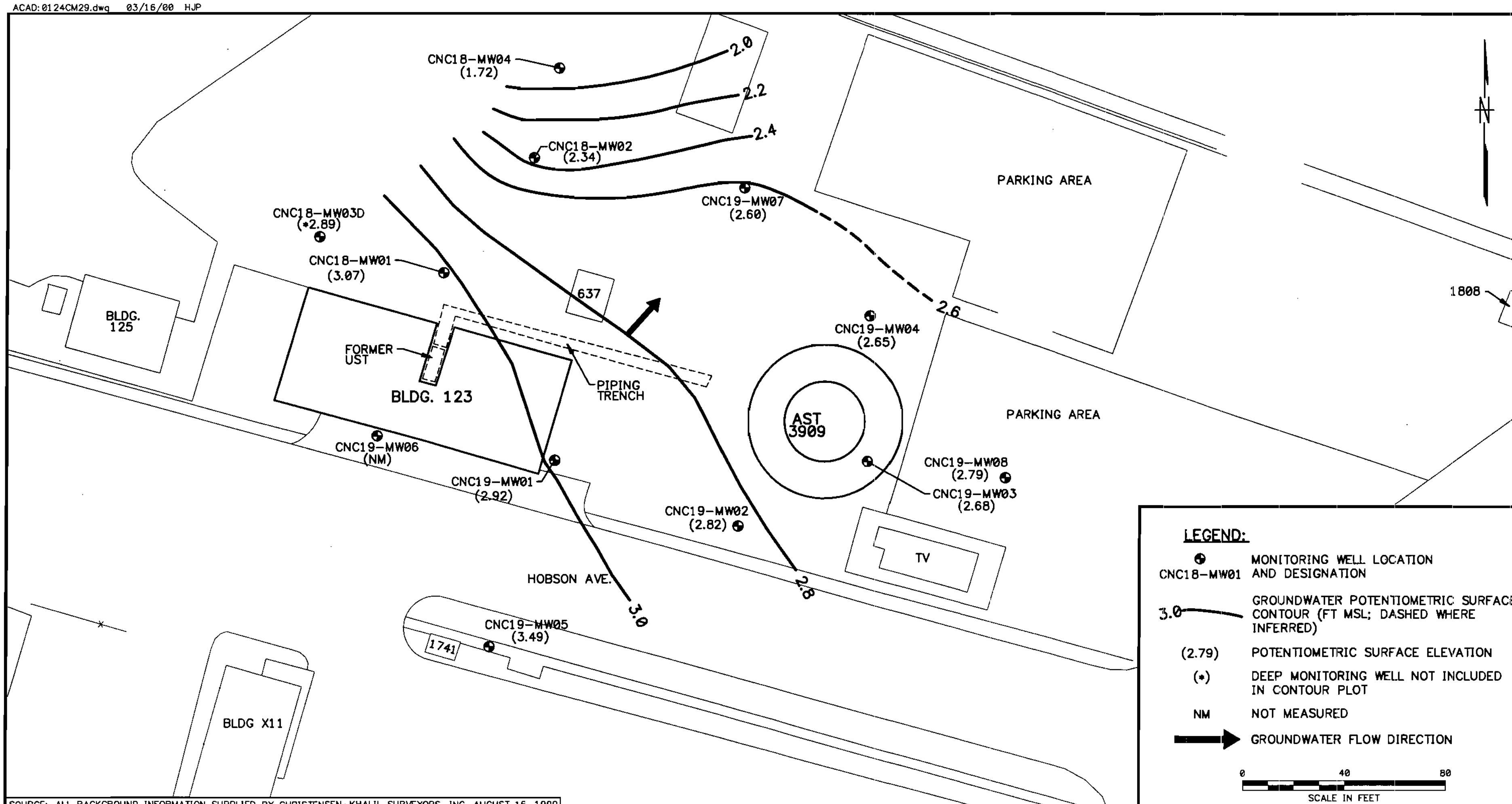

SOURCE: ALL BACKGROUND INFORMATION SUPPLIED BY CHRISTENSEN-KHALIL SURVEYORS, INC. AUGUST 16, 1999

NO.	DATE	REVISIONS	BY	CHKD	APPD	REFERENCES

DRAWN BY / DATE	MF 10/26/99
CHECKED BY / DATE	
COST/SCHED-AREA	
SCALE	AS NOTED

GROUNDWATER POTENTIOMETRIC MAP
SEPTEMBER 9, 1999
SITE 18 BUILDING 123 AND
SITE 19 AST 3909
ZONE G, CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

CONTRACT NO.	0124
APPROVED BY / DATE	
APPROVED BY / DATE	
DRAWING NO.	FIGURE 6
REV.	0

FORM CADD NO. SDIV_BH.DWG - REV 0 - 1/20/98

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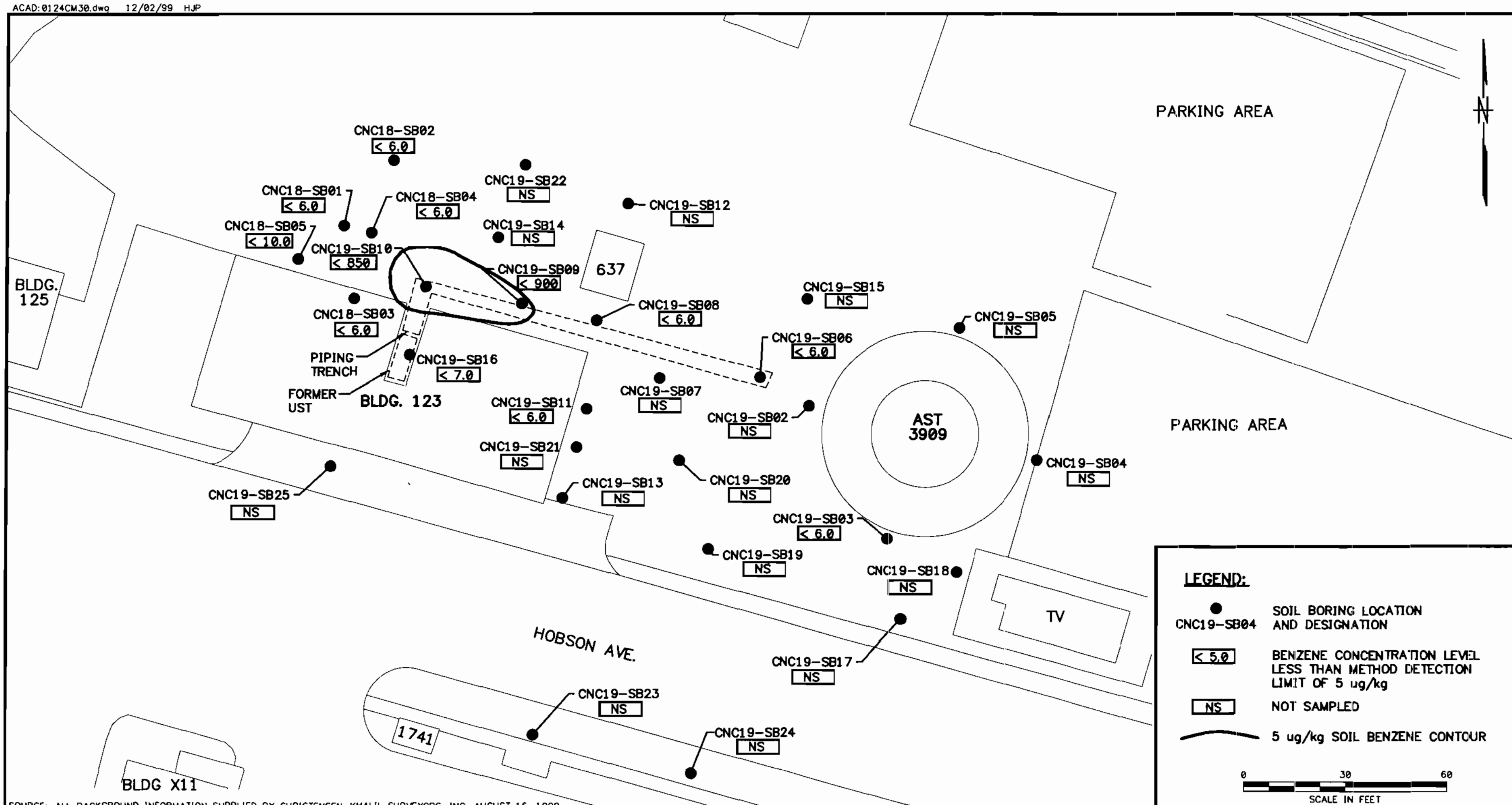


SOURCE: ALL BACKGROUND INFORMATION SUPPLIED BY CHRISTENSEN-KHALIL SURVEYORS, INC. AUGUST 16, 1999

NO.	DATE	REVISIONS	BY	CHKD	APPD	REFERENCES

DRAWN BY MF DATE 10/26/99
CHECKED BY DATE
COST/SCHED-AREA
SCALE AS NOTED

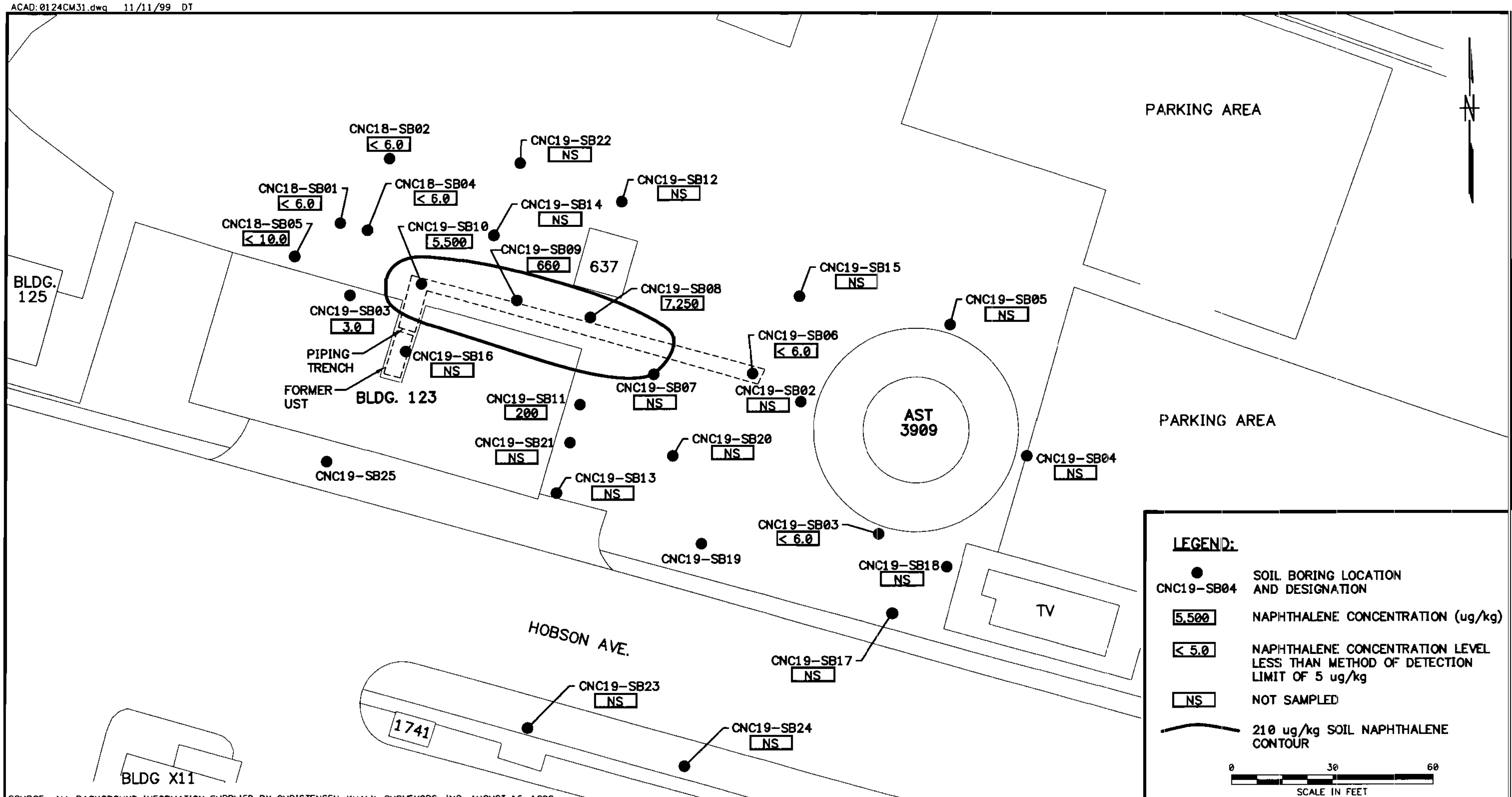
DEPARTMENT OF THE NAVY · SOUTHERN DIV FACILITIES ENGINEERING COMMAND

SOIL BENZENE CONCENTRATION MAP
MAY 1999
SITE 18 BUILDING 123 AND
SITE 19 AST 3909
ZONE G, CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

CONTRACT NO. 0124
APPROVED BY DATE
APPROVED BY DATE
DRAWING NO. FIGURE 7
REV. 0

FORM CADD NO. SDIV_BH.DWG - REV D - 1/20/98

ACAD:0124CM31.dwg 11/11/99 DT



SOURCE: ALL BACKGROUND INFORMATION SUPPLIED BY CHRISTENSEN-KHALIL SURVEYORS, INC. AUGUST 16, 1999

NO.	DATE	REVISIONS	BY	CHKD	APPD	REFERENCES

DRAWN BY: MF DATE: 10/26/99
CHECKED BY DATE
COST/SCHED-AREA
SCALE: AS NOTED

SOIL NAPHTHALENE CONCENTRATION MAP
MAY 1999
SITE 18 BUILDING 123 AND
SITE 19 AST 3909
ZONE G, CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

CONTRACT NO. 0124
APPROVED BY DATE
APPROVED BY DATE
DRAWING NO. FIGURE 8 REV. 0

FORM CADD NO. SDIV_BH.DWG - REV 0 - 1/20/98

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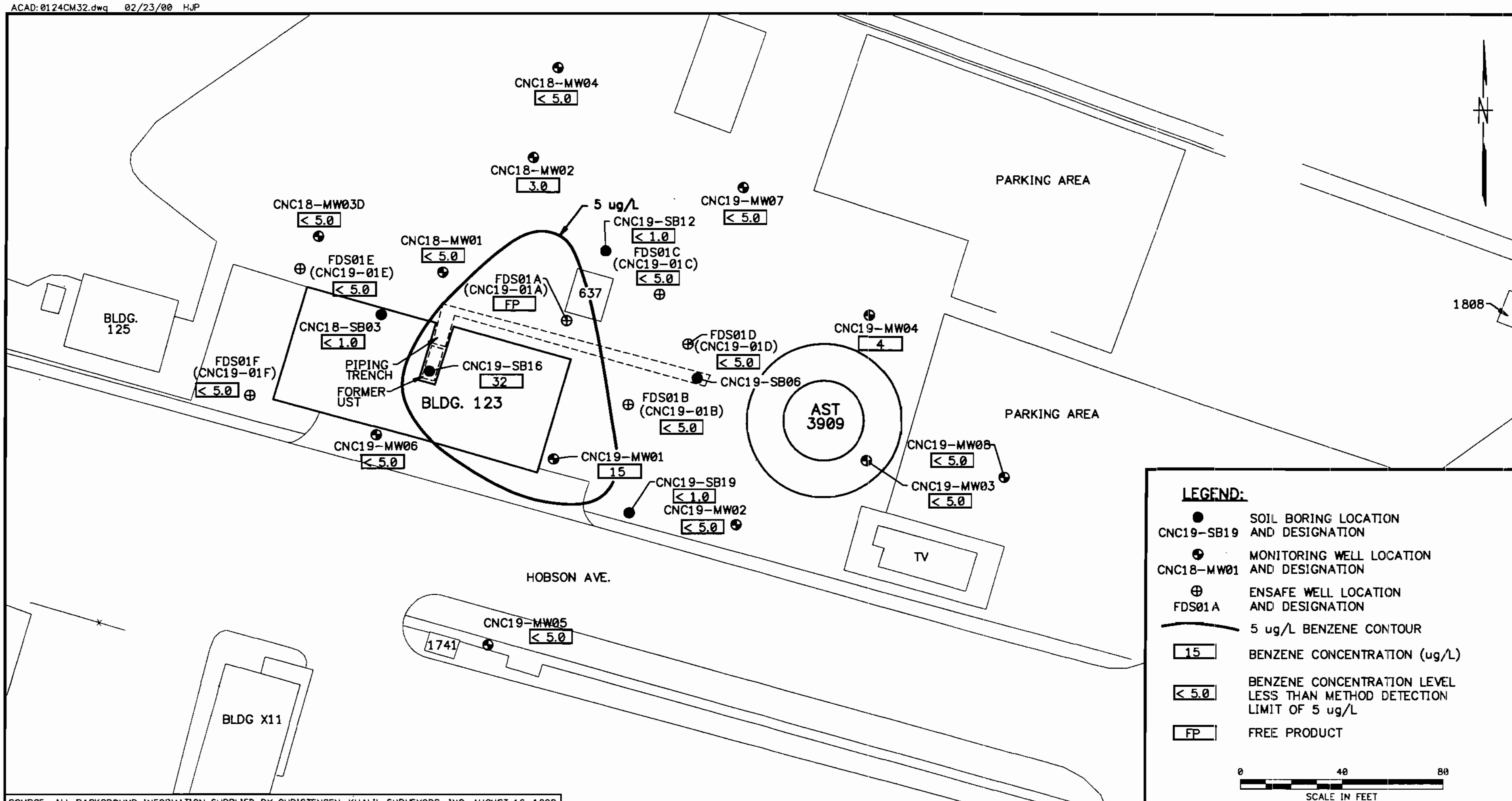

SOURCE: ALL BACKGROUND INFORMATION SUPPLIED BY CHRISTENSEN-KHALIL SURVEYORS, INC. AUGUST 16, 1999

NO.	DATE	REVISIONS	BY	CHKD	APPD	REFERENCES

DRAWN BY: MF DATE: 10/26/99
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COST/SCHED-AREA
SCALE: AS NOTED

DEPARTMENT OF THE NAVY — SOUTHERN DIV FACILITIES ENGINEERING COMMAND

GROUNDWATER BENZENE CONCENTRATION MAP
SEPTEMBER 9, 1999
SITE 18 BUILDING 123 AND
SITE 19 AST 3909
ZONE G, CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

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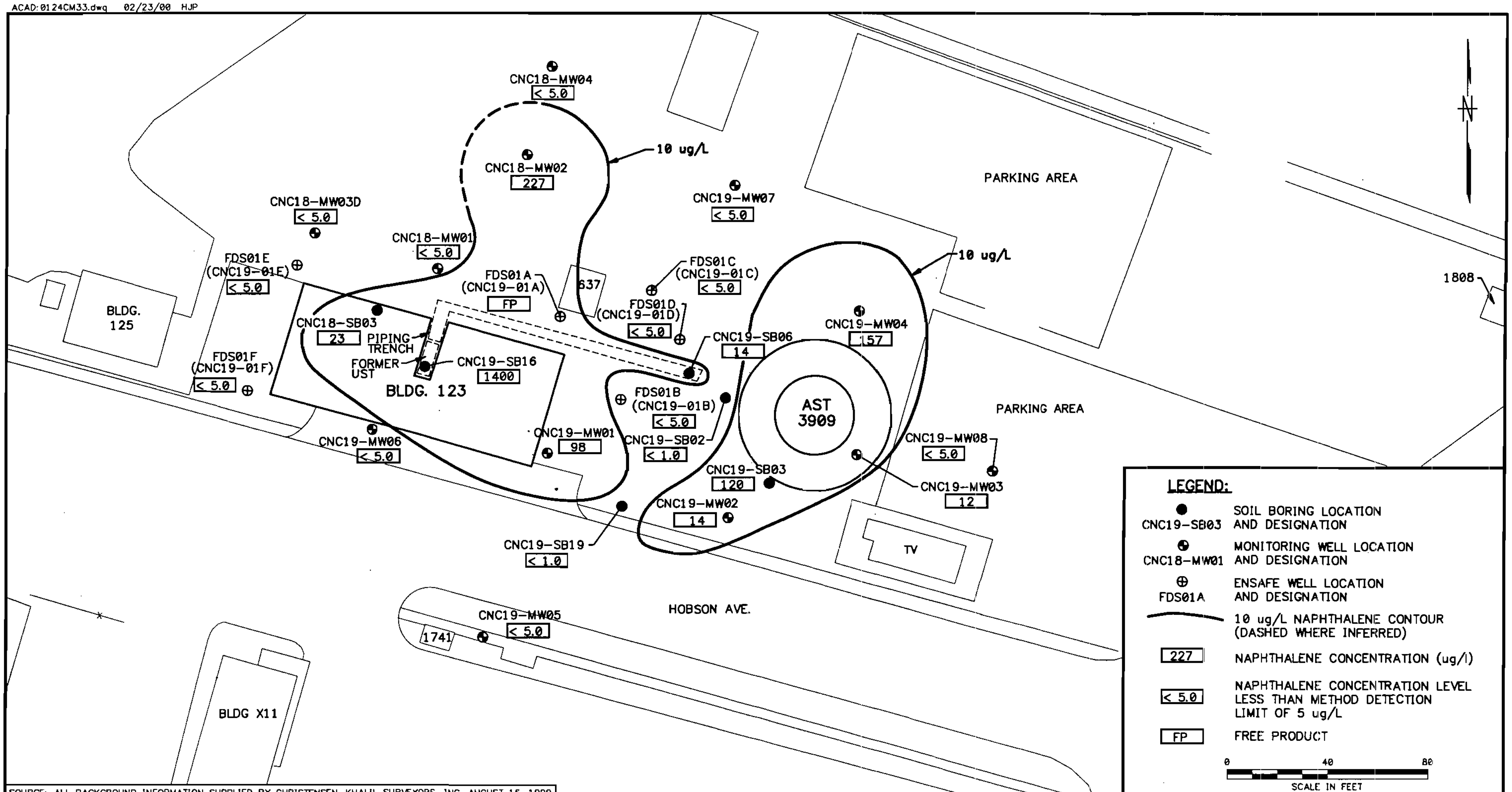

SOURCE: ALL BACKGROUND INFORMATION SUPPLIED BY CHRISTENSEN-KHALIL SURVEYORS, INC. AUGUST 16, 1999

NO.	DATE	REVISIONS	BY	CHKD	APPD	REFERENCES

DRAWN BY MF DATE 10/26/99
CHECKED BY DATE
COST/SCHED-AREA
SCALE AS NOTED

GROUNDWATER NAPHTHALENE CONCENTRATION MAP, SEPTEMBER 3, 1999
SITE 18 BUILDING 123 AND SITE 19 AST 3909
ZONE G, CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

CONTRACT NO. 0124
APPROVED BY DATE
APPROVED BY DATE
DRAWING NO. FIGURE 10
REV. 0

FORM CADD NO. SDIV_BH.DWG - REV 0 - 1/20/98

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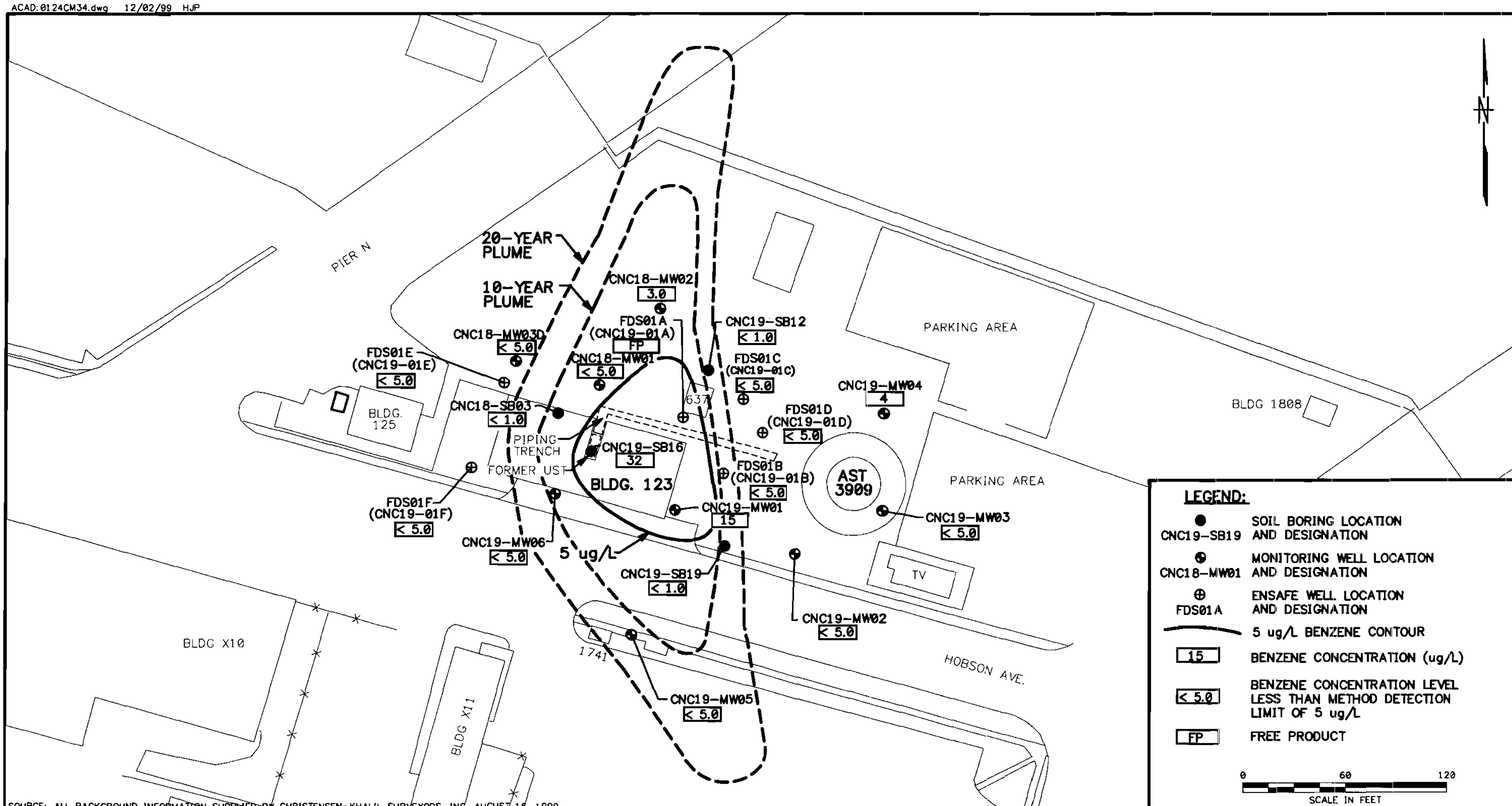

SOURCE: ALL BACKGROUND INFORMATION SUPPLIED BY CHRISTENSEN-KHALIL SURVEYORS, INC. AUGUST 16, 1999

NO.	DATE	REVISIONS	BY	CHKD	APPD	REFERENCES

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COST/SCHED-AREA
SCALE AS NOTED

10-YEAR & 20-YEAR PLUME MIGRATION PREDICTION OF BENZENE SITE 18 BUILDING 123 AND SITE 19 AST 3909 ZONE G, CHARLESTON NAVAL COMPLEX NORTH CHARLESTON, SOUTH CAROLINA

CONTRACT NO. 0124
APPROVED BY DATE
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DRAWING NO. FIGURE 11 REV. 0

FORM CADD NO. SDIV_BH.DWG - REV 0 - 1/20/98

APPENDIX A

UNDERGROUND STORAGE TANK ASSESSMENT REPORT
UST 123 and AST 3909

Mr. Gabriel L. Magwood
Southern Division NFEC
P.O. Box 190010
2155 Eagle Drive
North Charleston, South Carolina 29419-9010

Re: Assessment Report dated October 17, 1996
Charleston Naval Base Building # 123 (Site Identification # 10763) (Zone G)
Charleston County

Date: December 17, 1996

Dear Mr. Magwood:

The author has completed technical review of the referenced document. As submitted, the report provides analytical results of environmental sampling conducted to determine if releases have occurred from operation of the referenced underground storage tank system. The results presented indicate elevated levels of polynuclear aromatic hydrocarbons (PAH) and RCRA metals (total) were detected in areas of the tank pit (soils) and elevated levels of RCRA metals detected in groundwater. The results exceed the levels proposed in the Soil Corrective Action Plan (dated July 18, 1996) and established Maximum Contaminant Levels (mcl) for drinking water and appear to necessitate additional endeavors for remedial actions (soils removal) and contamination characterization (assessment activities, including groundwater investigations), as appropriate. In this regard, assessment/corrective action activities provided in the Tank Management Plan (dated October 18, 1996) should be implemented in an appropriate and timely manner. Please be reminded that groundwater sampling (if necessary) will require construction of sampling points and will need to be submitted for prior review and approval, as appropriate.

Should you have any questions, please contact me at (803) 734-5328.

Sincerely,

Paul L. Bristol

Paul L. Bristol, Hydrogeologist
Groundwater Assessment and Development Section
Bureau of Water

cc: Trident District EQC

Active CAP ?

UST ASSESSMENT REPORT
UST 123-1
NAVAL BASE CHARLESTON
CHARLESTON SC

- 1000 gal waste oil inst 1977
- pet stained soils
- odor
- sheen on GW
- Naph > RBSL in soil & GW

Prepared for:

DEPARTMENT OF THE NAVY
SOUTHERN DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
CHARLESTON SC

Prepared by:

SUPERVISOR OF SHIPBUILDING, CONVERSION
AND REPAIR, USN, PORTSMOUTH DETACHMENT
ENVIROMENTAL CHARLESTON, SC
1899 NORTH HOBSON AVE.
NORTH CHARLESTON SC 29405-2106

October 17, 1996

South Carolina Department of Health and Environmental Control (S.C.D.H.E.C.)
Underground Storage Tank (UST) Assessment Report

Date Received State Use Only	*Submit Completed Form to:* UST Regulatory Section SCDHEC 2600 Bull Street Columbia, South Carolina 29201 Telephone (803) 734-5331

I OWNERSHIP OF UST(S)

Agency/Owner: Southern Division, Naval Facilities Engineering Command, Caretaker Site Office

Mailing Address: P.O. Box 190010

City: N. Charleston State: SC Zip Code: 29419-9010

Area Code: 803 Telephone Number: 743-9985 Contact Person: LCDR Paul Rose

II SITE IDENTIFICATION AND LOCATION

Site I.D. #: 16763

Facility Name: Charleston Naval Base Complex, Building 123

Street Address: South Hobson Avenue

City: North Charleston, 29405-2413 County: Charleston

III CLOSURE INFORMATION

Closure Started: 19 June 1996 Closure Completed: 20 June 1996

Number of USTs Closed: 1

N/A
Consultant

SPORTENVDETCHASN
UST Removal Contractor

IV. CERTIFICATION (Read and Sign after completing entire submittal)

I certify that I have personally examined and am familiar with the information submitted in this and all attached documents and that based on my inquiry of those individuals responsible for obtaining this information, I believe that the submitted information is true, accurate and complete.

LCDR Paul Rose
Name (Type or Print)

Signature

V. UST INFORMATION

		Tank 1	Tank 2	Tank 3	Tank 4	Tank 5	Tank 6
A.	Product	Waste Oil					
B.	Capacity	1,000 gal.					
C.	Age	7/1977					
D.	Construction Material	Steel					
E.	Month/Year of Last Use	Unk.					
F.	Depth (ft.) To Base of Tank	10'					
G.	Spill Prevention Equipment Y/N	N					
H.	Overfill Prevention Equipment Y/N	N					
I.	Method of Closure Removed/Filled	R					
J.	Visible Corrosion or Pitting Y/N	N					
K.	Visible Holes Y/N	N					

L. Method of disposal for any USTs removed from the ground (attach disposal manifests)

The UST was removed from the ground, drained, and cleaned. It was then cut up for recycling as scrap metal. See Attachment III.

M. Method of disposal for any liquid petroleum, sludges, or waste waters removed from the USTs (attach disposal manifests)

The residual waste oil was shipped out as non-regulated sludge.

N. If any corrosion, pitting, or holes were observed, describe the location and extent for each UST

The tank was in good condition. It did not appear to have any holes or leaks.

VI. PIPING INFORMATION

	Tank 1	Tank 2	Tank 3	Tank 4	Tank 5	Tank 6
A. Construction Material	Steel					
B. Distance from UST to Dispenser	4'					
C. Number of Dispensers	1					
D. Type of System P/S	N/A*					
E. Was Piping Removed from the Ground? Y/N	Y					
F. Visible Corrosion or Pitting Y/N	N					
G. Visible Holes Y/N	N					
H. Age	> 20 yrs					

*UST 123-1 was a gravity fed waste oil tank for an oil/water separator. The tank was emptied periodically by suctioning into a waste oil collection truck.

I. If any corrosion, pitting, or holes were observed, describe the location and extent for each line.

No corrosion, pitting, or holes were found in the UST piping. The water in the excavation came from a slow leak in the 4" cast iron sewer line that ran above UST 123-1. This line was cut and capped during excavation. See Attachment I, Site Map Number 2.

VII. BRIEF SITE DESCRIPTION AND HISTORY

Bldg 123 is a former Boiler House that supplied steam to ships and parts of the Naval Base. UST 123-1 was a regulated 1,000 gallon underground storage tank on the east side of the building. The UST stored waste oil from an oil/water separator.

AST 3909 is located approximately 150 feet from the UST 123-1 site. The 200,000 gallon tank supplied fuel oil to the boilers in Bldg 123 via underground piping. See Site Map Number 4.

VIII. SITE CONDITIONS

		Yes	No	Unk
A.	Were any petroleum-stained or contaminated soils found in the UST excavation, soil borings, trenches, or monitoring wells? If yes, indicate depth and location on the site map. [*3'-10']	X*		
B.	Were any petroleum odors detected in the excavation, soil borings, trenches, or monitoring wells? If yes, indicate location on site map and describe the odor (strong, mild, etc.) [*mild]	X*		
C.	Was water present in the UST excavation, soil borings, or trenches? If yes, how far below land surface (indicate location and depth)? UST excavation, 6" deep. See Note 1.	X		
D.	Did contaminated soils remain stockpiled on site after closure? If yes, indicate the stockpile location on the site map. Name of DHEC representative authorizing soil removal: See Note 2.	X		
E.	Was a petroleum sheen or free product detected on any excavation or boring waters? If yes, indicate location and thickness. [*No appreciable thickness]	X*		

Note 1: A condensate tank draining evolution was taking place from within Building 123 concurrent with the UST removal. The water drained into a broken sewer line that ran above the UST and dumped into the excavation.

Note 2: The contaminated soil is located at Bldg 123. Per conversation with DHEC, Mr. Tim Mettlen, and Mr. Gabriel Magwood of SouthDiv, the entire naval complex is considered the site.

IX. SAMPLE INFORMATION

S.C.D.H.E.C. Lab Certification Number ___10120___

Sample #	Location	Sample Type (Soil/Water)	Depth*	Date/Time of Collection	Collected By	OVA#
SPORT 0082-1	East end of tank.	Soil	9'	20 June 96 1500	W. Nesbit	Not Taken
SPORT 0082-2	West end of tank.	Soil	9'	20 June 96 1500	W. Nesbit	Not Taken
SPORT 0082-3	Western portion of ground water pool.	Water	10'	20 June 96 1500	W. Nesbit	Not Taken

* = Depth Below the Surrounding Land Surface

X. SAMPLING METHODOLOGY

Provide a detailed description of the methods used to collect <u>and</u> store (preserve) the samples.

After the removal of UST123-1 soil and ground water samples were taken. Sampling was performed in accordance with SC DHEC R.61-92 Part 280 and SC DHEC UST Assessment Guidelines.

The samples are identified as follows:

	Detachment Charleston		General Engineering Labs
Soil Sample	UST123-1-1	=	SPORT -0082-1
Soil Sample	UST123-1-2	=	SPORT -0082-2
Ground Water Sample	UST123-1-3	=	SPORT -0082-3

Sample jars were prepared by the testing laboratory. The grab method was utilized to fill the sample containers leaving as little head space as possible and immediately capped. Soil samples were extracted at the tank ends above the ground water level. The ground water sample was taken from the western portion of the ground water pool.

The samples were marked, logged, and immediately placed in sample coolers packed with ice to maintain an approximate temperature of 4° C. Tools were thoroughly cleaned and decontaminated with organic-free soap and water after each sample.

The samples remained in the custody of SPORTENVDETCHASN until they were transferred to General Engineering Laboratories for analysis as documented in the attached Chain-of-Custody Record.

XI. RECEPTORS

		Yes	No
A.	Are there any lakes, ponds, streams, or wetlands located within 1000 feet of the UST system? [* Cooper River 160'] If yes, indicate type of receptor, distance, and direction on site map.	X*	
B.	Are there any public, private, or irrigation water supply wells within 1000 feet of the UST system? If yes, indicate type of well, distance, and direction on site map.		X
C.	Are there any underground structures (e.g., basements) located within 100 feet of the UST system? [* oily/water separator, adjacent] If yes, indicate the type of structure, distance, and direction on site map.	X*	
D.	Are there any underground utilities (e.g., telephone, electricity, gas, water, sewer, storm drain) located within 100 feet of the UST system that could potentially come in contact with the contamination? [* sewer] If yes, indicate the type of utility, distance, and direction on the site map.	X*	
E.	Has contaminated soil been identified at a depth of less than 3 feet below land surface in an area that is not capped by asphalt or concrete? If yes, indicate the area of contaminated soil on the site map.	X	

Attachment I

SITE MAP

You must supply a scaled site map. It should include all buildings, road names, utilities, tank and pump island locations, sample locations, extent of excavation, and any other pertinent information.

Site Maps 1, 2, 3, and 4
Photographs 1 and 2

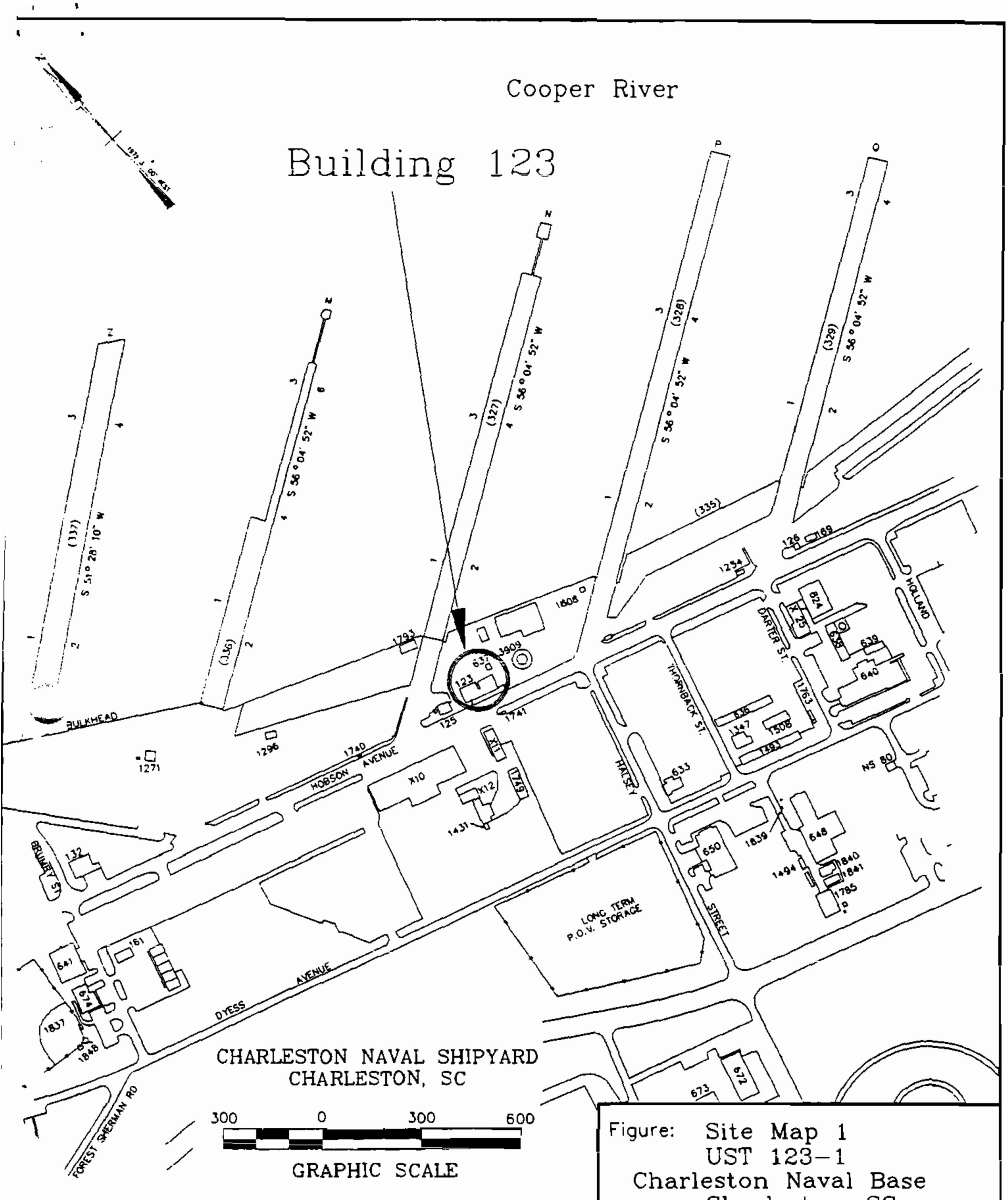


Figure: Site Map 1
UST 123-1
Charleston Naval Base
Charleston, SC

SPORTENVDETCHASN
1899 North Hobson Avenue
North Charleston, SC 29405-2106

DWG DATE: 30 Sept 1996

DWG NAME: B123_1

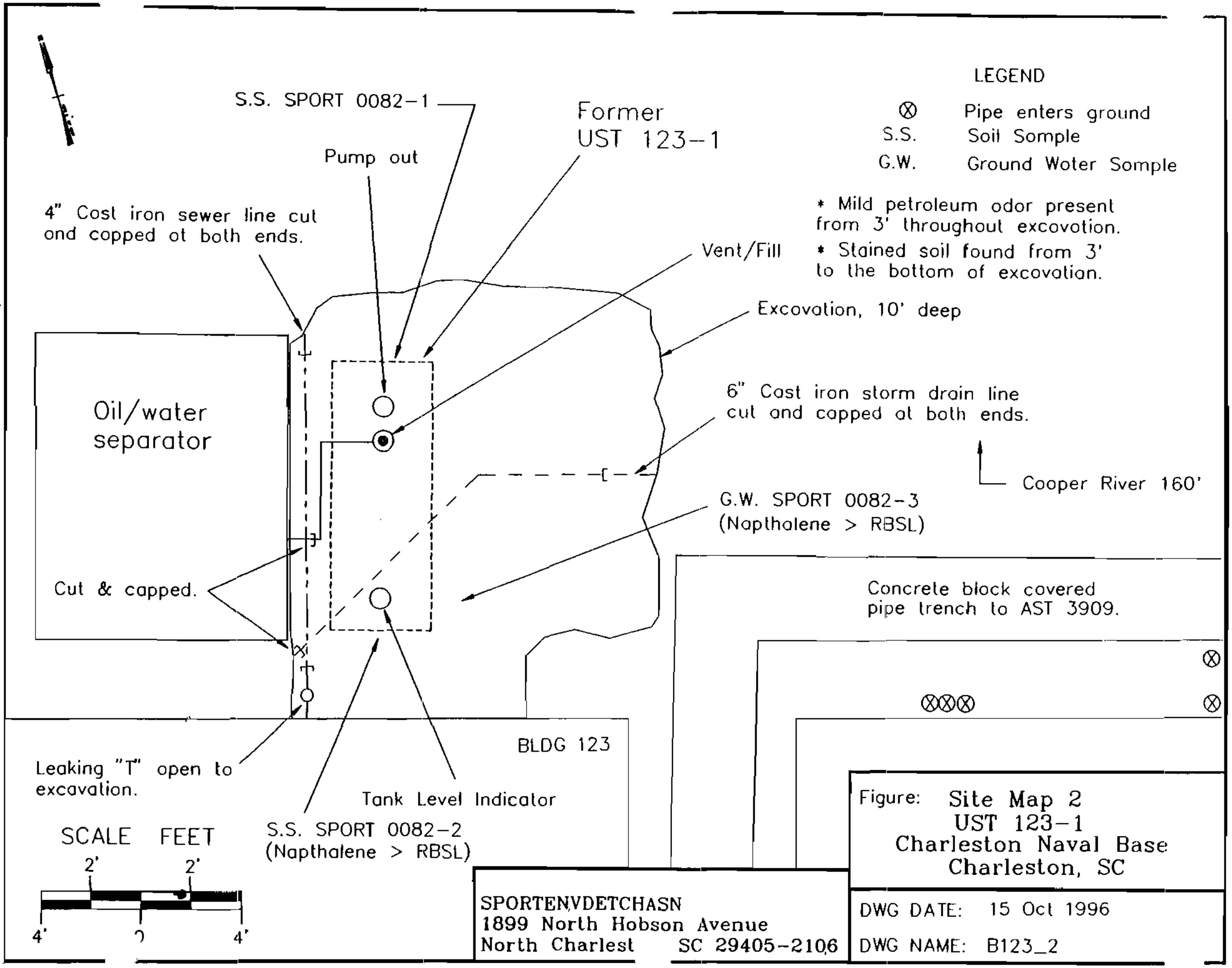
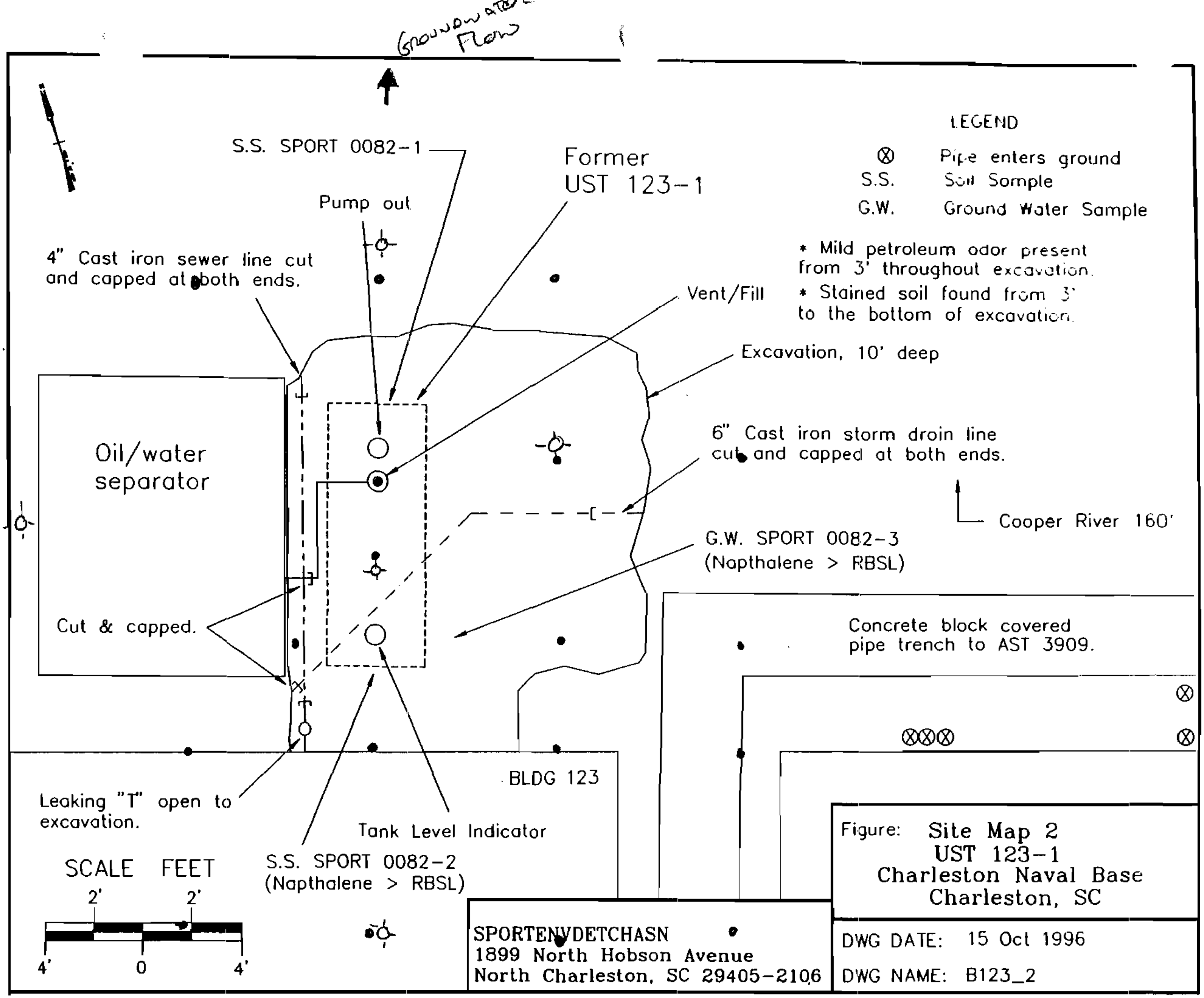


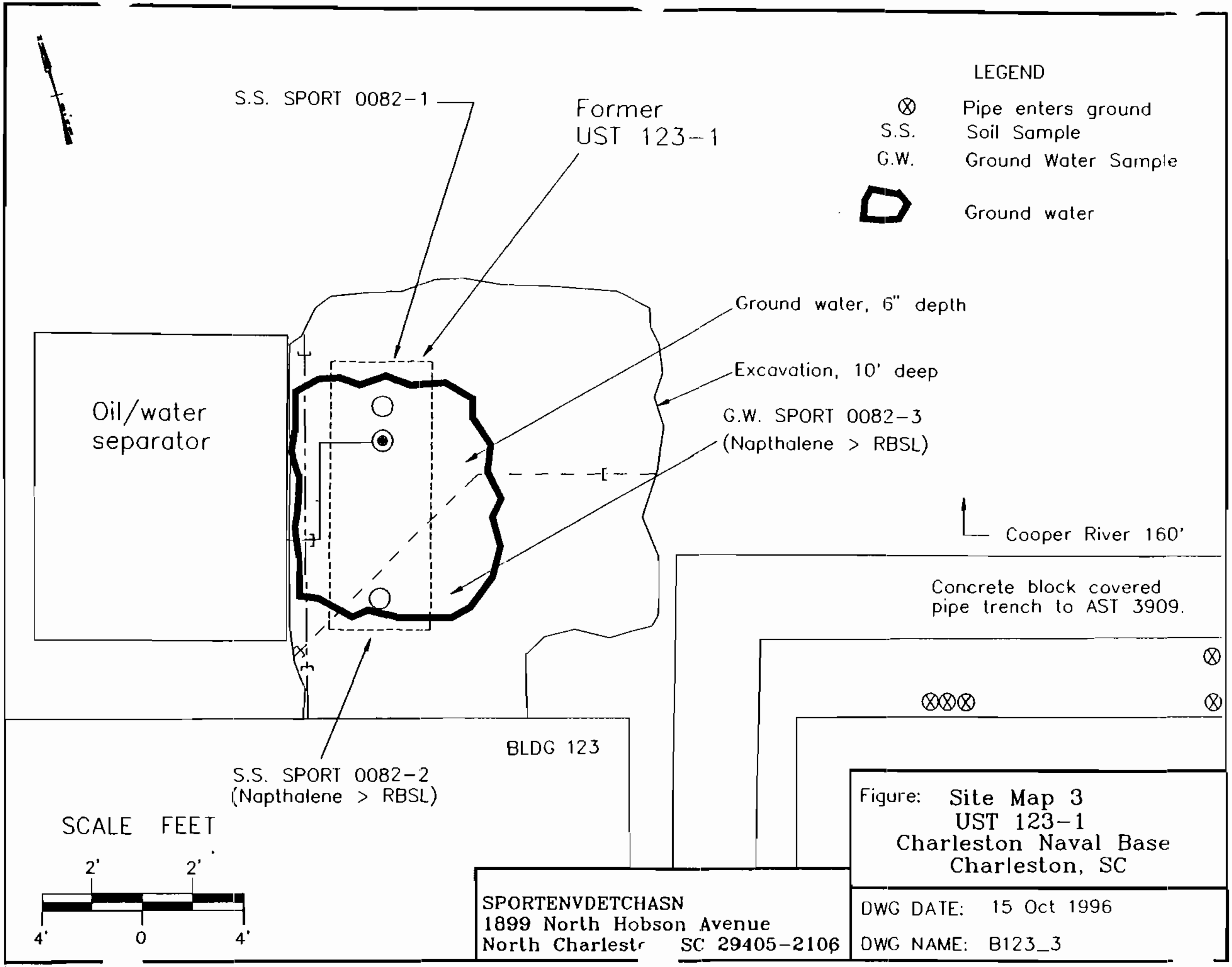
Figure: Site Map 2
UST 123-1
Charleston Naval Base
Charleston, SC

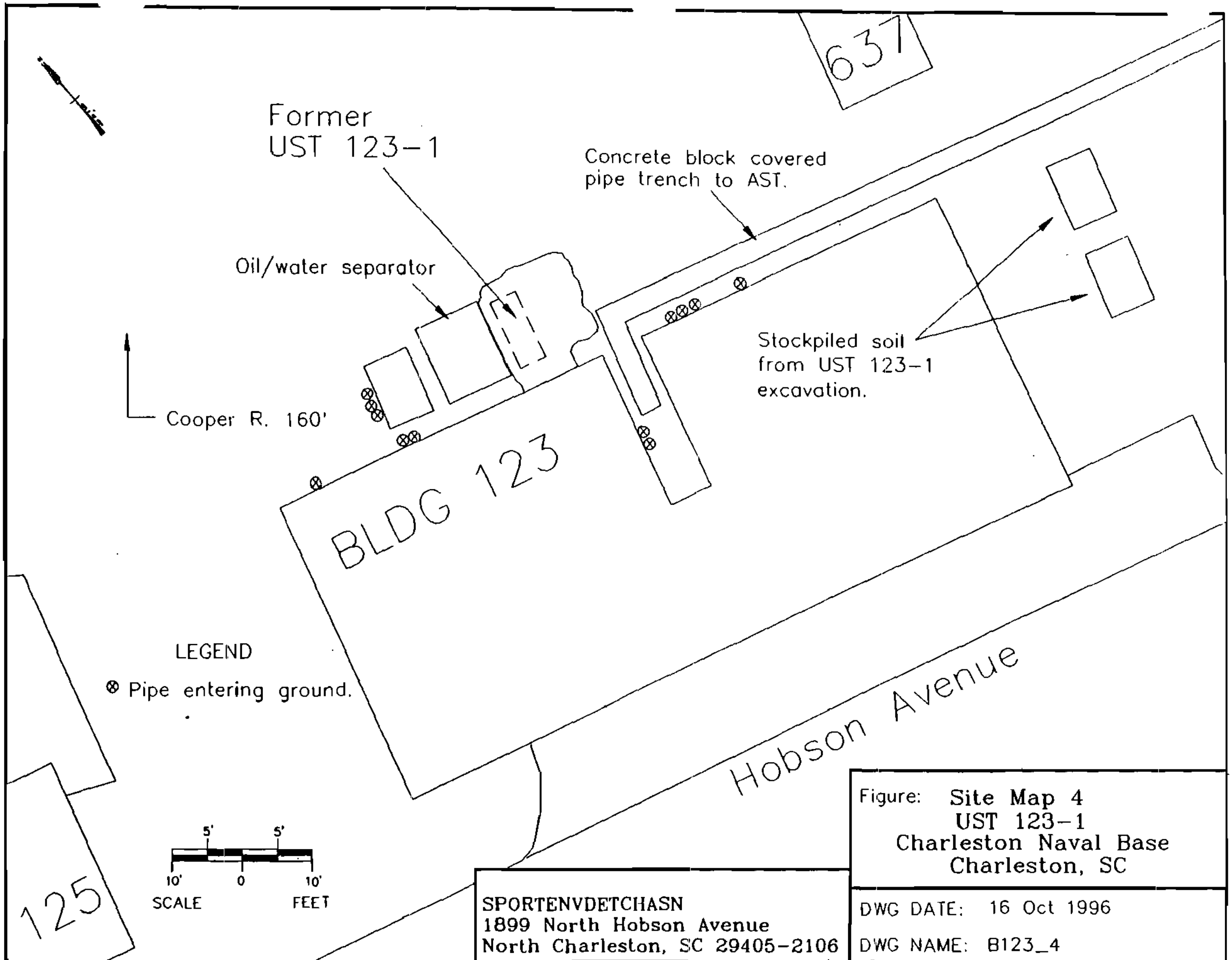
SPORTENVDETCHASN
1899 North Hobson Avenue
North Charlest SC 29405-2106

DWG DATE: 15 Oct 1996

DWG NAME: B123_2


Groundwater Flow
LEGEND
⊗ Pipe enters ground
S.S. Soil Sample
G.W. Ground Water Sample
* Mild petroleum odor present from 3' throughout excavation.
* Stained soil found from 3' to the bottom of excavation.
S.S. SPORT 0082-1
Former UST 123-1
Pump out
4" Cast iron sewer line cut and capped at both ends.
Vent/Fill
Excavation, 10' deep
Oil/water separator
6" Cast iron storm drain line cut and capped at both ends.
Cooper River 160'
G.W. SPORT 0082-3 (Napthalene > RBSL)
Cut & capped.
Concrete block covered pipe trench to AST 3909.
BLDG 123
Leaking "T" open to excavation.
Tank Level Indicator
S.S. SPORT 0082-2 (Napthalene > RBSL)
SCALE FEET
2' 2'
4' 0 4'
SPORTENVDETCHASN
1899 North Hobson Avenue
North Charleston, SC 29405-2106
Figure: Site Map 2
UST 123-1
Charleston Naval Base
Charleston, SC
DWG DATE: 15 Oct 1996
DWG NAME: B123_2


LEGEND
Pipe enters ground
S.S. Soil Sample
G.W. Ground Water Sample
Ground water
S.S. SPORT 0082-1
Former
UST 123-1
Ground water, 6" depth
Excavation, 10' deep
G.W. SPORT 0082-3
(Napthalene > RBSL)
Oil/water
separator
Cooper River 160'
Concrete block covered
pipe trench to AST 3909.
BLDG 123
S.S. SPORT 0082-2
(Napthalene > RBSL)
SCALE FEET
2' 2'
4' 0 4'
Figure: Site Map 3
UST 123-1
Charleston Naval Base
Charleston, SC
SPORTENVDETCHASN
1899 North Hobson Avenue
North Charlest SC 29405-2106
DWG DATE: 15 Oct 1996
DWG NAME: B123_3


637
Former
UST 123-1
Concrete block covered
pipe trench to AST.
Oil/water separator
Stockpiled soil
from UST 123-1
excavation.
Cooper R. 160'
BLDG 123
LEGEND
⊗ Pipe entering ground.
Hobson Avenue
5'
5'
10'
0
10'
SCALE
FEET
125
SPORTENVDETCHASN
1899 North Hobson Avenue
North Charleston, SC 29405-2106
Figure: Site Map 4
UST 123-1
Charleston Naval Base
Charleston, SC
DWG DATE: 16 Oct 1996
DWG NAME: B123_4

UST 123-1

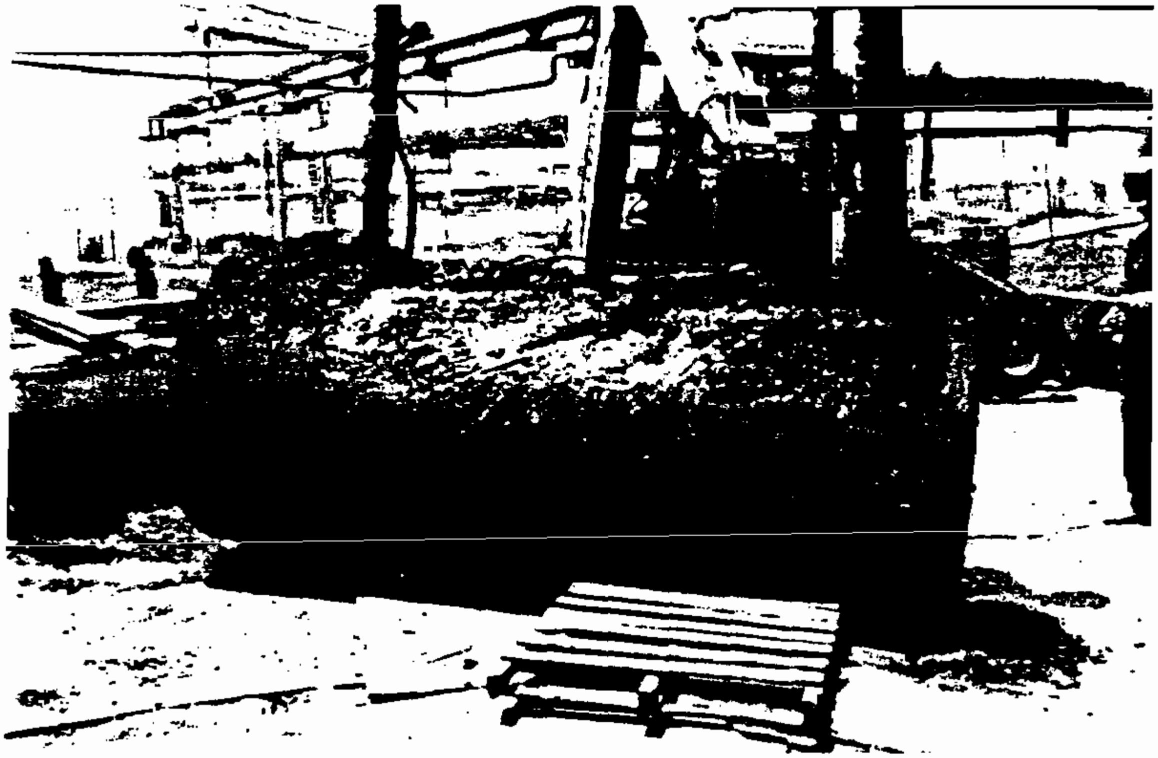


Photo 1: UST 123-1 immediately after removal.

Photo 2: UST 123-1 excavation after removal of the UST. Discolored soil is from backfill of previous pipe repair excavation. Free product film in groundwater has no appreciable depth.

Attachment II

ANALYTICAL RESULTS

You must submit the laboratory report and chain-of-custody form for the samples. These samples must be analyzed by a South Carolina certified laboratory.

Certified Analytical Results
Chain-of-Custody

GENERAL ENGINEERING LABORATORIES

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CERTIFICATE OF ANALYSIS

Client:	Supervisor of Ship Building & Conversion SUPSHIP-Portsmouth Detachment-Env. 1899 North Hobson Ave. North Charleston, South Carolina 29405-2106
Contact:	Mr. Bill Hiers
Project Description:	SUPSHIP-Portsmouth Detachment

cc: NPWC00196 Report Date: July 01, 1996

Sample ID	: SPORT0082-1
Lab ID	: 9606402-01
Matrix	: Soil
Date Collected	: 06/20/96
Date Received	: 06/21/96
Priority	: Routine
Collector	: Client

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
Volatile Organics											
EX - 4 items											
Benzene	U	0.00	20.0	40.0	ug/kg	20.	JAC	06/24/96	1255	86322	1
Ethylbenzene	U	0.00	20.0	40.0	ug/kg	20.					
Toluene	U	7.40	20.0	40.0	ug/kg	20.					
Xylenes (TOTAL)	U	0.00	20.0	40.0	ug/kg	20.					
Naphthalene	U	0.00	20.0	40.0	ug/kg	20.					
Extractable Organics											
Polynuclear Aromatic Hydrocarbons - 16 items											
Acenaphthene		4240	1660	3310	ug/kg	10.	JCB	06/25/96	2345	86390	2
Acenaphthylene	U	0.00	1660	3310	ug/kg	10.					
Anthracene		5660	1660	3310	ug/kg	10.					
Benzo(a)anthracene	J	2710	1660	3310	ug/kg	10.					
Benzo(a)pyrene	J	1750	1660	3310	ug/kg	10.					
Benzo(b)fluoranthene	J	2090	1660	3310	ug/kg	10.					
Benzo(ghi)perylene	U	0.00	1660	3310	ug/kg	10.					
Benzo(k)fluoranthene	U	0.00	1660	3310	ug/kg	10.					
Chrysene	U	0.00	1660	3310	ug/kg	10.					
Dibenzo(a,h)anthracene	U	0.00	1660	3310	ug/kg	10.					
Fluoranthene		12400	1660	3310	ug/kg	10.					
Fluorene	J	2650	1660	3310	ug/kg	10.					
Indeno(1,2,3-c,d)pyrene	U	0.00	1660	3310	ug/kg	10.					
Naphthalene	U	0.00	1660	3310	ug/kg	10.					
Phenanthrene		16300	1660	3310	ug/kg	10.					
Pyrene		9570	1660	3310	ug/kg	10.					
Metals Analysis											
Mercury	J	0.152	0.00232	0.200	mg/kg	1.0	RMJ	06/26/96	1309	86352	N
Silver	U	8.23	125	500	ug/kg	1.0	NRM	06/27/96	2116	86447	3
Arsenic		15400	93.0	500	ug/kg	1.0					

P O Box 30712 • Charleston, SC 29417 • (803) 556-8171 • Fax (803) 766-1178 *9606402-01*

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CERTIFICATE OF ANALYSIS

Client:	Supervisor of Ship Building & Conversion SUPSHIP-Portsmouth Detachment-Env. 1899 North Hobson Ave. North Charleston, South Carolina 29405-2106
Contact:	Mr. Bill Hiers
Project Description:	SUPSHIP-Portsmouth Detachment

cc: NPWC00196 Report Date: July 01, 1996

Sample ID : SPORT0082-1

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
Barium		33700	3.32	500	ug/kg	1.0					
Cadmium	J	181	4.85	250	ug/kg	1.0	NRM	06/27/96	2116	86447	3
Chromium		18700	29.8	500	ug/kg	1.0					
Lead		114000	56.5	250	ug/kg	1.0					
Selenium		870	71.5	250	ug/kg	1.0					
General Chemistry											
Total Rec. Petro. Hydrocarbons		678	10.0	50.0	mg/kg	1.0	JEN	06/26/96	1200	86423	4

The following prep procedures were performed:

GC/MS Base/Neutral Compounds	GWL	06/25/96	1630	86390	5
Mercury	RMJ	06/25/96	1500	86352	6
TRACE	FGD	06/26/96	1500	86447	7

Comments:

A dilution was required for Volatile Organics due to a high concentration of hydrocarbons. A dilution was required for Extractable Organics due to a high concentration of target compounds and matrix interference.

As a result, the detection limits are elevated.

Surrogate Recovery	Test	Percent%	Acceptable Limits
2-Fluorobiphenyl	M610	0.00*	(30.0 - 115.)
Nitrobenzene-d5	M610	0.00*	(23.0 - 120.)
p-Terphenyl-d14	M610	0.00*	(37.3 - 128.)
Bromofluorobenzene	BTEX-8260	102.	(59.7 - 159.)
Dibromofluoromethane	BTEX-8260	95.2	(74.0 - 128.)
Toluene-d8	BTEX-8260	90.8	(53.4 - 163.)
Bromofluorobenzene	NAP-8260	102.	(59.7 - 159.)
Dibromofluoromethane	NAP-8260	95.2	(74.0 - 128.)
Toluene-d8	NAP-8260	90.8	(53.4 - 163.)

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SUPSHIP-Portsmouth Detachment-Env.
1899 North Hobson Ave.
North Charleston, South Carolina 29405-2106
Contact: Mr. Bill Hiers
Project Description: SUPSHIP-Portsmouth Detachment

cc: NPWC00196 Report Date: July 01, 1996

Sample ID : SPORT0082-1

M = Method	Method-Description
M 1	EPA 8260
M 2	EPA 8270
M 3	EPA 6010A
M 4	EPA 9071
M 5	EPA 3550
M 6	EPA 7471
M 7	EPA 3050

Notes:
The qualifiers in this report are defined as follows:
J indicates presence of analyte at a concentration less than the reporting limit (RL) and greater than the detection limit (DL).
U indicates that the analyte was not detected at a concentration greater than the detection limit.
* indicate that a quality control analyte recovery is outside of specified acceptance criteria.

GEL Laboratory Certifications		EPI Laboratory Certifications	
AL - 41040	AZ - AZ0514	AL - 41050	AZ - AZ0514
CA - 2089	CT - PH-0169	CA - I-1023/2056	CT - PH-0175
DE - SC012	FL - E87156/87294	FL - E87472/87458	MS - 29417
ME - SC012	MS - 10120	NY - 11502	RI - 138
NC - 233	NY - 11501	SC - 10582	TN - 02934
RI - 135	SC - 10120	UT - E-227	VA - 00111
TN - 02934	UT - E-251	WA - C225	NJ - 79002

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Contact:	Mr. Bill Hiers
Project Description:	SUPSHIP-Portsmouth Detachment

cc: NPWC00196 Report Date: July 01, 1996

Sample ID : SPORT0082-1

GEL Laboratory Certifications		EPI Laboratory Certifications	
VA - 00151	WA - C223	PA - 68-485	WV - 235
WI - 999887790			

This data report has been prepared and reviewed in accordance with General Engineering Laboratories standard operating procedures. Please direct questions to your Project Manager, Karen Blakeney at (803) 769-7386.

Jennifer J. Green

Analytical Report Specialist

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SUPSHIP-Portsmouth Detachment-Env.
1899 North Hobson Ave.
North Charleston, South Carolina 29405-2106

Contact: Mr. Bill Hiers

Project Description: SUPSHIP-Portsmouth Detachment

cc: NPWC00196 Report Date: July 01, 1996

Sample ID	: SPORT0082-2
Lab ID	: 9606402-02
Matrix	: Soil
Date Collected	: 06/20/96
Date Received	: 06/21/96
Priority	: Routine
Collector	: Client

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
Volatile Organics											
EX - 4 items											
enzene	U	0.00	20.0	40.0	ug/kg	20.	JAC	06/24/96	1754	86322	1
Ethylbenzene	U	0.00	20.0	40.0	ug/kg	20.					
Toluene	U	0.00	20.0	40.0	ug/kg	20.					
Xylenes (TOTAL)	U	7.40	20.0	40.0	ug/kg	20.					
Naphthalene		610	20.0	40.0	ug/kg	20.					
Extractable Organics											
Polynuclear Aromatic Hydrocarbons - 16 items											
Acenaphthene		7140	1650	3290	ug/kg	10.	JCB	06/26/96	0017	86390	2
Acenaphthylene	U	0.00	1650	3290	ug/kg	10.					
Anthracene		8820	1650	3290	ug/kg	10.					
Benzo(a)anthracene	J	3190	1650	3290	ug/kg	10.					
Benzo(a)pyrene	U	0.00	1650	3290	ug/kg	10.					
Benzo(b)fluoranthene	J	2600	1650	3290	ug/kg	10.					
Benzo(ghi)perylene	U	0.00	1650	3290	ug/kg	10.					
Benzo(k)fluoranthene	U	0.00	1650	3290	ug/kg	10.					
Chrysene	U	1650	1650	3290	ug/kg	10.					
Dibenzo(a,h)anthracene	U	0.00	1650	3290	ug/kg	10.					
Fluoranthene		18300	1650	3290	ug/kg	10.					
Fluorene		4670	1650	3290	ug/kg	10.					
Indeno(1,2,3-c,d)pyrene	U	0.00	1650	3290	ug/kg	10.					
Naphthalene	U	0.00	1650	3290	ug/kg	10.					
Phenanthrene		26700	1650	3290	ug/kg	10.					
Pyrene		16400	1650	3290	ug/kg	10.					
Metals Analysis											
Mercury		0.304	0.00226	0.200	mg/kg	1.0	RMJ	06/26/96	1312	86352	N
ilver	U	-14.2	123	500	ug/kg	1.0	NRM	06/27/96	2120	86447	3
Arsenic		13600	92.1	500	ug/kg	1.0					

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Contact:	Mr. Bill Hiers
Project Description:	SUPSHIP-Portsmouth Detachment

cc: NPWC00196 Report Date: July 01, 1996

Sample ID : SPORT0082-2

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
Barium		27900	3.28	500	ug/kg	1.0					
Cadmium	J	81.4	4.80	250	ug/kg	1.0	NRM	06/27/96	2120	86447	3
Chromium		28300	29.5	500	ug/kg	1.0					
Lead		65900	55.9	250	ug/kg	1.0					
Selenium		861	70.8	250	ug/kg	1.0					
General Chemistry											
Total Rec. Petro. Hydrocarbons		445	10.0	50.0	mg/kg	1.0	JEN	06/26/96	1200	86423	4

The following prep procedures were performed:

	Analyst	Date	Time	Batch	M
GC/MS Base/Neutral Compounds	GWL	06/25/96	1630	86390	5
Mercury	RMJ	06/25/96	1500	86352	6
TRACE	FGD	06/26/96	1500	86447	7

Comments:

A dilution was required for Volatile Organics due to a high concentration of hydrocarbons. A dilution was required for Extractable Organics due to a high concentration of target compounds and matrix interference.

As a result, the detection limits are elevated.

Surrogate Recovery	Test	Percent%	Acceptable Limits
2-Fluorobiphenyl	M610	0.00*	(30.0 - 115.)
Nitrobenzene-d5	M610	0.00*	(23.0 - 120.)
p-Terphenyl-d14	M610	0.00*	(37.3 - 128.)
Bromofluorobenzene	BTEX-8260	96.8	(59.7 - 159.)
Dibromofluoromethane	BTEX-8260	95.6	(74.0 - 128.)
Toluene-d8	BTEX-8260	96.4	(53.4 - 163.)
Bromofluorobenzene	NAP-8260	96.8	(59.7 - 159.)
Dibromofluoromethane	NAP-8260	95.6	(74.0 - 128.)
Toluene-d8	NAP-8260	96.4	(53.4 - 163.)

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CERTIFICATE OF ANALYSIS

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Contact:	Mr. Bill Hiers
Project Description:	SUPSHIP-Portsmouth Detachment

cc: NPWC00196 Report Date: July 01, 1996

Sample ID : SPORT0082-2

M = Method	Method-Description
M 1	EPA 8260
M 2	EPA 8270
M 3	EPA 6010A
M 4	EPA 9071
M 5	EPA 3550
M 6	EPA 7471
M 7	EPA 3050

Notes:
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U indicates that the analyte was not detected at a concentration greater than the detection limit.
* indicate that a quality control analyte recovery is outside of specified acceptance criteria.

GEL Laboratory Certifications		EPI Laboratory Certifications	
AL - 41040	AZ - AZ0514	AL - 41050	AZ - AZ0514
CA - 2089	CT - PH-0169	CA - I-1023/2056	CT - PH-0175
DE - SC012	FL - E87156/87294	FL - E87472/87458	MS - 29417
ME - SC012	MS - 10120	NY - 11502	RI - 138
NC - 233	NY - 11501	SC - 10582	TN - 02934
RI - 135	SC - 10120	UT - E-227	VA - 00111
TN - 02934	UT - E-251	WA - C225	NJ - 79002

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GENERAL ENGINEERING LABORATORIES

Meeting today's needs with a vision for tomorrow.

CERTIFICATE OF ANALYSIS

Client:	Supervisor of Ship Building & Conversion SUPSHIP-Portsmouth Detachment-Env. 1899 North Hobson Ave. North Charleston, South Carolina 29405-2106
Contact:	Mr. Bill Hiers
Project Description:	SUPSHIP-Portsmouth Detachment

cc: NPWC00196 Report Date: July 01, 1996

Sample ID : SPORT0082-2

GEL Laboratory Certifications		EPI Laboratory Certifications	
VA - 00151 WI - 999887790	WA - C223	PA - 68-485	WV - 235

This data report has been prepared and reviewed in accordance with General Engineering Laboratories standard operating procedures. Please direct questions to your Project Manager, Karen Blakeney at (803) 769-7386.

Jennifer F. Green

Analytical Report Specialist

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GENERAL ENGINEERING LABORATORIES

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CERTIFICATE OF ANALYSIS

Client: Supervisor of Ship Building & Conversion
SUPSHIP-Portsmouth Detachment-Env.
1899 North Hobson Ave.
North Charleston, South Carolina 29405-2106
Contact: Mr. Bill Hiers
Project Description: SUPSHIP-Portsmouth Detachment

cc: NPWC00196 Report Date: July 02, 1996

Sample ID	: SPORT0082-3
Lab ID	: 9606402-03
Matrix	: GroundH2O
Date Collected	: 06/20/96
Date Received	: 06/21/96
Priority	: Routine
Collector	: Client

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
Volatile Organics											
EX - 4 items											
enzene	U	0.00	50.0	100	ug/l	50.	THL	06/27/96	1601	86429	1
Ethylbenzene	U	0.00	50.0	100	ug/l	50.					
Toluene	U	0.00	50.0	100	ug/l	50.					
Xylenes (TOTAL)	U	0.00	50.0	100	ug/l	50.					
Naphthalene	U	26.5	50.0	100	ug/l	50.					
Extractable Organics											
Polynuclear Aromatic Hydrocarbons - 16 items											
Acenaphthene	U	0.00	50.0	100	ug/l	10.	BDG	06/25/96	1607	86295	2
Acenaphthylene	U	0.00	50.0	100	ug/l	10.					
Anthracene	U	0.00	50.0	100	ug/l	10.					
Benzo(a)anthracene	U	0.00	50.0	100	ug/l	10.					
Benzo(a)pyrene	U	0.00	50.0	100	ug/l	10.					
Benzo(b)fluoranthene	U	0.00	50.0	100	ug/l	10.					
Benzo(ghi)perylene	U	0.00	50.0	100	ug/l	10.					
Benzo(k)fluoranthene	U	0.00	50.0	100	ug/l	10.					
Chrysene	U	0.00	50.0	100	ug/l	10.					
Dibenzo(a,h)anthracene	U	0.00	50.0	100	ug/l	10.					
Fluoranthene	J	51.0	50.0	100	ug/l	10.					
Fluorene	U	0.00	50.0	100	ug/l	10.					
Indeno(1,2,3-c,d)pyrene	U	0.00	50.0	100	ug/l	10.					
Naphthalene	U	0.00	50.0	100	ug/l	10.					
Phenanthrene	U	0.00	50.0	100	ug/l	10.					
Pyrene	U	0.00	50.0	100	ug/l	10.					
Metals Analysis											
Mercury		9.13	0.0148	0.500	ug/l	1.0	DVW	06/25/96	1117	86350	N
lver	J	3.66	2.49	10.0	ug/l	1.0	NRM	06/28/96	0213	86385	3
Arsenic		416	1.86	10.0	ug/l	1.0					

GENERAL ENGINEERING LABORATORIES

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CERTIFICATE OF ANALYSIS

Client:	Supervisor of Ship Building & Conversion SUPSHIP-Portsmouth Detachment-Env. 1899 North Hobson Ave. North Charleston, South Carolina 29405-2106
Contact:	Mr. Bill Hiers
Project Description:	SUPSHIP-Portsmouth Detachment

cc: NPWC00196 Report Date: July 02, 1996

Sample ID : SPORT0082-3

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
Barium		1050	0.0663	10.0	ug/l	1.0					
Cadmium		15.4	0.0970	5.00	ug/l	1.0	NRM	06/28/96	0213	86385	3
Chromium		475	0.596	10.0	ug/l	1.0					
Lead		3640	1.13	5.00	ug/l	1.0					
Selenium		11.4	1.43	5.00	ug/l	1.0					
General Chemistry											
Total Rec. Petro. Hydrocarbons		253	2.00	2.00	mg/l	1.0	JEN	06/24/96	1025	86317	4

The following prep procedures were performed:

GC/MS Base/Neutral Compounds	TNF	06/24/96	1000	86295	5
Mercury	RMJ	06/24/96	1500	86350	6
TRACE	FGD	06/26/96	1300	86385	7

Comments:

A dilution was required for Volatile Organics due to a high concentration of hydrocarbons. A dilution was required for Extractable Organics due to matrix interference.

As a result, the detection limits are elevated.

Surrogate Recovery	Test	Percent%	Acceptable Limits
2-Fluorobiphenyl	M610	0.00*	(43.0 - 108.)
Nitrobenzene-d5	M610	0.00*	(35.0 - 111.)
p-Terphenyl-d14	M610	0.00*	(33.0 - 125.)
Bromofluorobenzene	BTEX-8260	89.2	(80.0 - 128.)
Dibromofluoromethane	BTEX-8260	122.	(67.7 - 135.)
Toluene-d8	BTEX-8260	92.2	(76.8 - 122.)
Bromofluorobenzene	NAP-8260	89.2	(80.0 - 128.)
Dibromofluoromethane	NAP-8260	122.	(67.7 - 135.)
Toluene-d8	NAP-8260	92.2	(76.8 - 122.)

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CERTIFICATE OF ANALYSIS

Client:	Supervisor of Ship Building & Conversion SUPSHIP-Portsmouth Detachment-Env. 1899 North Hobson Ave. North Charleston, South Carolina 29405-2106
Contact:	Mr. Bill Hiers
Project Description:	SUPSHIP-Portsmouth Detachment

cc: NPWC00196 Report Date: July 02, 1996

Sample ID : SPORT0082-3

M = Method	Method-Description
M 1	EPA 8260
M 2	EPA 8270
M 3	EPA 6010A
M 4	EPA 9070A
M 5	EPA 3510
M 6	EPA 7470
M 7	EPA 3005

Notes:
The qualifiers in this report are defined as follows:
J indicates presence of analyte at a concentration less than the reporting limit (RL) and greater than the detection limit (DL).
U indicates that the analyte was not detected at a concentration greater than the detection limit.
* indicate that a quality control analyte recovery is outside of specified acceptance criteria.

GEL Laboratory Certifications		EPI Laboratory Certifications	
AL - 41040	AZ - AZ0514	AL - 41050	AZ - AZ0514
CA - 2089	CT - PH-0169	CA - I-1023/2056	CT - PH-0175
DE - SC012	FL - E87156/87294	FL - E87472/87458	MS - 29417
ME - SC012	MS - 10120	NY - 11502	RI - 138
NC - 233	NY - 11501	SC - 10582	TN - 02934
RI - 135	SC - 10120	UT - E-227	VA - 00111
TN - 02934	UT - E-251	WA - C225	NJ - 79002

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Contact:	Mr. Bill Hiers
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cc: NPWC00196 Report Date: July 02, 1996

Sample ID : SPORT0082-3

GEL Laboratory Certifications		EPI Laboratory Certifications	
VA - 00151	WA - C223	PA - 68-485	WV - 235
WI - 999887790			

This data report has been prepared and reviewed in accordance with General Engineering Laboratories standard operating procedures. Please direct questions to your Project Manager, Karen Blakeney at (803) 769-7386.

Karen Blakeney

Analytical Report Specialist

9606402-03

NF 00196

BHS

General Engineering [illegible] ries, Inc.
2040 Savage Road
Charleston, South Ca. 29414
P.O. Box 30712
Charleston, South Carolina 29417
(803) 556-8171

CHAIN OF CUSTODY RECORD

Page 1 of 1 9606402

Client Name/Facility Name: SPORTENVDETCHASN

Collected by/Company: SPORTENVDETCHASN

SAMPLE ANALYSIS REQUIRED (X) - use remarks area to specify specific compounds or methods

Use F or P in the boxes to indicate whether sample was filtered and/or preserved

CCL 21957

	SAMPLE ID	DATE	TIME	WELL	SOIL	COMP.	GRAB	# OF CONTAINERS	pH, conductivity	TOC/DOC	~~TOX~~ TPH GRAVIMETRIC	Chloride, Fluoride, Sulfide	Nitrite/Nitrate	VOC - Specify Method required	RCRA METALS - specify	Pesticide	Herbicide	Total Phenol	Acid Extractables	B/N Extractables	PCB's	Cyanide	Coliform - specify type	BTEX PLUS NAPTHALENE	PAH	Remarks	
01	SPORT0082-1	6/20/96	1500		X		X	4			X				X									X	X	UST-123-1-1 Soil	.1
02	SPORT0082-2	6/20/96	1500		X		X	4			X				X									X	X	UST-123-1-2 Soil	.1
03	SPORT0082-3	6/20/96	1500				X	8			X				X									X	X	UST-123-1-3 GW	.2
04	SPORT0082-4	6/20/96	1500				X	3																X		UST-123-1 Trip Blank	.3

Relinquished by:	Date:	Time:	Received by:	Relinquished by:	Date:	Time:	Received by:
[signature]	6/21/96	0935	W. R. Hiers, Jr.	[signature]	6/21/96	1409	Michael [signature]

Relinquished by:	Date:	Time:	Received by lab by:	Date:	Time:	Remarks:
Michael [signature]	6/21/96	1429	R [signature]	6-21-96	1430	

White = sample collector Yellow = file Pink = with report

Attachment III

Certificate of Disposal (tank)

UST Certificate of Disposal

CONTRACTOR

Supervisor of Shipbuilding, Conversion and Repair, USN
Portsmouth, VA
Environmental Detachment Charleston
1899 North Hobson Avenue
North Charleston 29405-2106

Telephone (803) 743-6482

TANK ID & LOCATION

UST 123-1; Bldg 123, Naval Base Charleston, N. Charleston, SC

DISPOSAL LOCATION

Bldg. 1601 Tank Cleaning
& Disposal Area
Charleston Naval Complex

TYPE OF TANK	SIZE (GAL)
Waste oil	1,000 gal.

CLEANING/DISPOSAL METHOD

The tank was cut open on both ends, cleaned with a steam cleaner, cut into sections, and disposed of as recyclable scrap metal.

DISPOSAL CERTIFICATION

I certify that the above tank has been properly cleaned and disposed of as recyclable scrap metal.

O.S. Ulhein / 10-2-96
(Name) (Date)

D H E C

PROMOTE PROTECT PROSPER

2600 Bull Street
Columbia, SC 29201-1708

ZONE G
17 July 1998

Department of the Navy
Southern Division NFEC
P.O. Box 190010
North Charleston, SC 29419-9010
Attn: Mr. Gabriel Magwood

Re: Aboveground Storage Tank Assessment Report dated 1 June 1998
AST 3909 (Site Identification # 010xx) (Zone G)
Charleston Naval Complex/Charleston Naval Base
Charleston, SC
Charleston County

Dear Mr. Magwood:

The author has completed technical review of the referenced document. As submitted, the report provides a narrative describing closure activities and analytical results of environmental sampling to determine if releases have occurred as a result of operation of the referenced vessel and/or associated piping system. The analytical results provided indicate reportable concentrations of PAH compounds were detected in soil grab samples obtained proximal to the AST foundation. The reported concentrations are below levels proposed in the SCAP (Soil Corrective Action Plan, amended July 1997). It should be noted that although sample results for SPORT 0616-2 were reported as BDL (below detection limits) the detection limit for this sample was elevated due to matrix interference. As noted in previous correspondence (Bristol to Amey, 2 September 1997), when contaminant concentrations are reported as zero (0) or BDL it will be assumed that the chemical constituent is equal to the elevated detection limit. With this consideration, the reported concentrations approach or exceed levels proposed in the SCAP (Soil Corrective Action Plan amended July 1997) for the Charleston Naval Complex and appear to indicate that additional endeavors for remedial actions and contaminant characterization are warranted at the referenced site. In this regard, assessment/corrective action activities proposed in the Tank Management Plan (dated October 1996) should be implemented in an appropriate and timely manner. Employed activities should be technically sufficient and reasonable to determine the extent and severity of suspected contamination. Please be reminded that groundwater sampling, if necessary, will require construction of sampling points and will need to be submitted for prior review and approval, as appropriate.

Further, appropriate consideration to the destruction and removal of the concrete piping trench should be incorporated with the above requested work.

Should you have any questions please contact me at (803) 734-5328.

Sincerely,

Paul L. Bristol

Paul L. Bristol, Hydrogeologist
Groundwater Quality Section
Bureau of Water

cc: Trident District EQC

DHEC

PROMOTE PROTECT PROSPER

2600 Bull Street
Columbia, SC 29201-1708

21 July 1998

Department of the Navy
Southern Division NFEC
P.O. Box 190010
North Charleston, SC 29419-9010
Attn: Mr. Gabriel Magwood

Re: SCDHEC Correspondence dated 17 July 1998
AST 3909 (Site Identification # 01093)
Charleston Naval Complex/Charleston Naval Base
Charleston, SC
Charleston County

Dear Mr. Magwood:

Please note that the Site Identification number assigned this site had been inadvertently omitted from the referenced document. The AST 3909 project will be tracked under Site Identification # 01093. The author apologizes for any inconvenience this omission may have caused.

Should you have any questions please contact me at (803) 734-5328.

Sincerely,

Paul L. Bristol, Hydrogeologist
Groundwater Quality Section
Bureau of Water

cc: Trident District EQC

AST - 200,000 gal fuel oil
- No stained soils at tank
- odor
- 8690 TRPH along piping

- Elevated PAH & TRPH at AST

ACAP

Aboveground Storage Tank (AST) Assessment Report

Date Received
State Use Only

Submit Completed Form to:
SCDHEC
2600 Bull Street
Columbia, South Carolina 29201
Telephone (803) 734-5331

I. OWNERSHIP OF AST(S)

Agency/Owner: Southern Division, Naval Facilities Engineering Command, Caretaker Site Office

Mailing Address: P.O. Box 190010

City: N. Charleston State: SC Zip Code: 29419-9010

Area Code: 843 Telephone Number: 743-9985 Contact Person: Henry N. Shepard II, P. E.

II. SITE IDENTIFICATION AND LOCATION

Site I.D. #: Unregulated

Facility Name: Charleston Naval Base Complex, AST 3909

Street Address: Dyess Avenue

City: North Charleston, 29405-2413 County: Charleston

III. CLOSURE INFORMATION

Closure Started: 5 Jan 1998 Closure Completed: 6 Feb 1998

Number of ASTs Closed: 1

N/A
Consultant

SPORTENVDETCHASN
AST Removal Contractor

IV. CERTIFICATION (Read and Sign after completing entire submittal)

I certify that I have personally examined and am familiar with the information submitted in this and all attached documents; and that based on my inquiry of those individuals responsible for obtaining this information, I believe that the submitted information is true, accurate and complete.

Henry Shepard II, P. E.
Name (Type or Print)

Henry N. Shepard II P.E. 5/27/98
Signature

- Any data on monitoring wells?

V. AST INFORMATION

	3909	Tank 2	Tank 3	Tank 4	Tank 5
A. Product..	Fuel oil				
B. Capacity...	200.000 gal.				
C. Age...	1964				
D. Construction Material............................	Steel				
E. Month/Year of Last Use........................	Unk.				
F. Spill Prevention Equipment Y/N.......	N				
G. Overfill Prevention Equipment Y/N....	N				
H. Method of Closure Removed/Filled..	R				
I. Visible Corrosion or Pitting Y/N.......	Y				
J. Visible Holes Y/N...............................	N				

L. Method of disposal for any ASTs removed.

AST 3909 was cleaned with a steam cleaner. cut into sections, and recycled as scrap metal. (See Attachment III.)

M. Method of disposal for any liquid petroleum, sludges, or waste waters removed from the ASTs.

All residual fuel oil, waste water, and sludge that could be pumped were recycled.

All sludge that was too thick to be pumped was characterized and found to be non-hazardous. This was disposed of as non-regulated sludge waste. (See Attachment III.)

N. If any corrosion, pitting, or holes were observed, describe the location and extent for each AST.

AST 3909 was in good condition. Only minor patches of corrosion were present. No pitting or holes were found.

VI. PIPING INFORMATION

	3909	Tank 2	Tank 3	Tank 4	Tank 5	Tank 6
A. Construction Material	Steel					
B. Distance from AST to Dispenser	160'					
C. Number of Dispensers	1 see history					
D. Type of System P/S	S					
E. Was Piping Removed Y/N	Y					
F. Visible Corrosion or Pitting Y/N	Y					
G. Visible Holes Y/N	N					
H. Age	1964					

I. If any corrosion, pitting, or holes were observed, describe the location and extent for each line.

The steel supply and return piping for AST 3909 was protected by a 10" steel conduit which ran through a concrete pipe trench with removable covers.

The piping was corroded throughout its length, but severely corroded where it entered Building 123, where it was unprotected and covered with an oily film. Oily sludge was found inside the steel conduit (see photos), but its source was not determined.

VII. BRIEF SITE DESCRIPTION AND HISTORY

AST 3909 was constructed on site in 1964 to supply fuel oil to the boilers of auxiliary boiler house Building 123. The tank sat on a concrete foundation filled with approximately 18" of sand. The sand served as a soft pad for the tank bottom. Some sand pads on other tanks were found to be oil impregnated. Samples SPORT 0590-1 & 2 and SPORT 0599-2 & 3 were taken to determine if AST 3909's sand pad was oil impregnated and if it had to be disposed of as petroleum contaminated waste. Although the total petroleum hydrocarbon results were elevated, it appears that the sand was not impregnated and a release did not occur; therefore, the sand was left in place.

VIII. SITE CONDITIONS

		Yes	No	Unk
A.	Were any petroleum-stained or contaminated soils found near the AST?		X	
B.	Were any petroleum odors detected? If yes, indicate location on site map and describe the odor (strong, mild, etc.)	X		

IX. SAMPLE INFORMATION

S.C.D.H.E.C. Lab Certification Number 10120

Sample #	Location	Sample Type (Soil/Water)	Depth*	Date/Time of Collection	Collected By	OVA#
SPORT 0590-1	AST foundation	Soil	18"	21 Jan 98 0845	W. Nesbit	8.1 ppm
SPORT 0590-2	AST foundation	Soil	18"	21 Jan 98 0930	W. Nesbit	7.8 ppm
SPORT 0599-2 & 0612-1	Pipe trench See Note 1.	Soil	2'	11 Feb 98 0940	W. Nesbit	Not Taken
SPORT 0599-3	AST foundation	Soil	18"	11 Feb 98 1005	W. Nesbit	Not Taken
SPORT 0599-4	AST foundation	Soil	18"	11 Feb 98 1025	W. Nesbit	Not Taken
SPORT 0616-2	Adjacent to tank.	Soil	2'	9 Mar 98 0950	W. Nesbit	0 ppm
SPORT 0616-3	Adjacent to tank.	Soil	2'	9 Mar 98 1025	W. Nesbit	0 ppm
SPORT 0616-4	Adjacent to tank.	Soil	2'	9 Mar 98 1059	W. Nesbit	0 ppm

Note 1: SPORT 0612-1 is a TCLIP metals test that was added to SPORT 0599-2.

X. SAMPLING METHODOLOGY

Provide a detailed description of the methods used to collect and store (preserve) the samples.

After the removal of AST 3909 and its associated piping, soil samples were taken. Sampling was performed in accordance with SC DHEC R.61-92 Part 280 and SC DHEC UST Assessment Guidelines.

Sample jars were prepared by the testing laboratory. The grab method was utilized to fill the sample containers leaving as little head space as possible and immediately capped. Samples were taken at strategic locations to characterize the site.

The samples were marked, logged, and immediately placed in sample coolers packed with ice to maintain an approximate temperature of 4° C. Tools were thoroughly cleaned and decontaminated with organic-free soap and water after each sample.

The samples remained in the custody of SPORTENVDETCHASN until they were transferred to General Engineering Laboratories for analysis as documented in the attached Chain-of-Custody Record.

XI. RECEPTORS

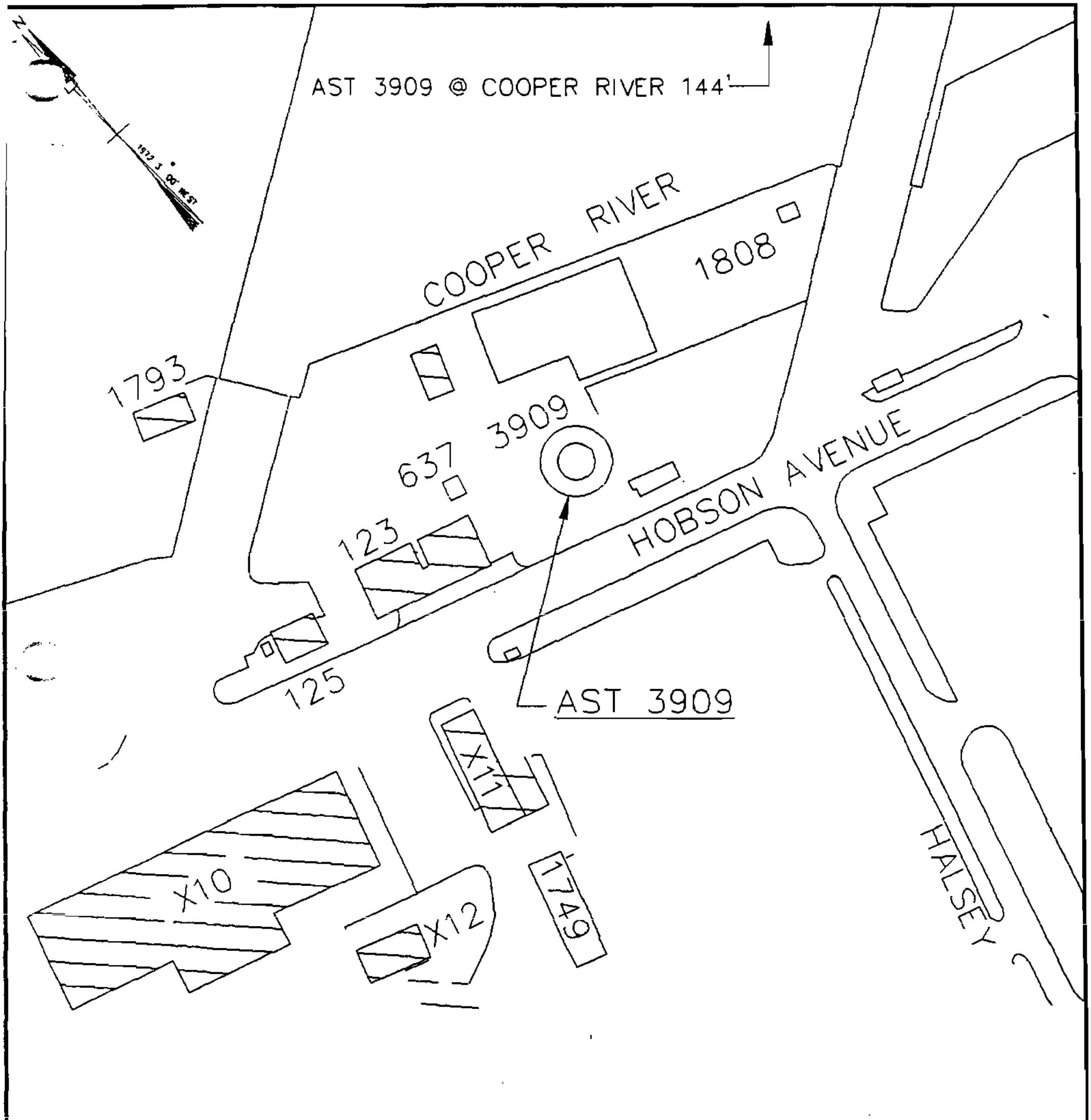
		Yes	No
A.	Are there any lakes, ponds, streams, or wetlands located within 1000 feet of the AST system? **[Cooper R. ~ 144']** If yes, indicate type of receptor, distance, and direction on site map.	X	
B.	Are there any public, private, or irrigation water supply wells within 1000 feet of the AST system? If yes, indicate type of well, distance, and direction on site map.		X
C.	Are there any underground structures (e.g., basements) located within 100 feet of the AST system? If yes, indicate the type of structure, distance, and direction on site map.		X
D.	Are there any underground utilities (e.g., telephone, electricity, gas, water, sewer, storm drain) located within 100 feet of the AST system that could potentially come in contact with the contamination? If yes, indicate the type of utility, distance, and direction on the site map. **[storm drain]**	X	

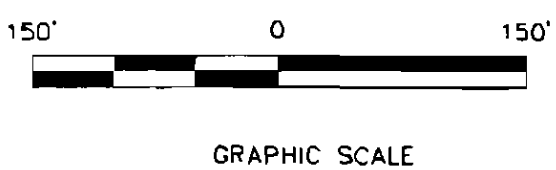
Attachment I

SITE MAP

You must supply a scaled site map. It should include all buildings, road names, utilities, tank and pump island locations, sample locations, extent of excavation, and any other pertinent information.

Site Maps 1, 2, and 3
Photographs 1 - 6

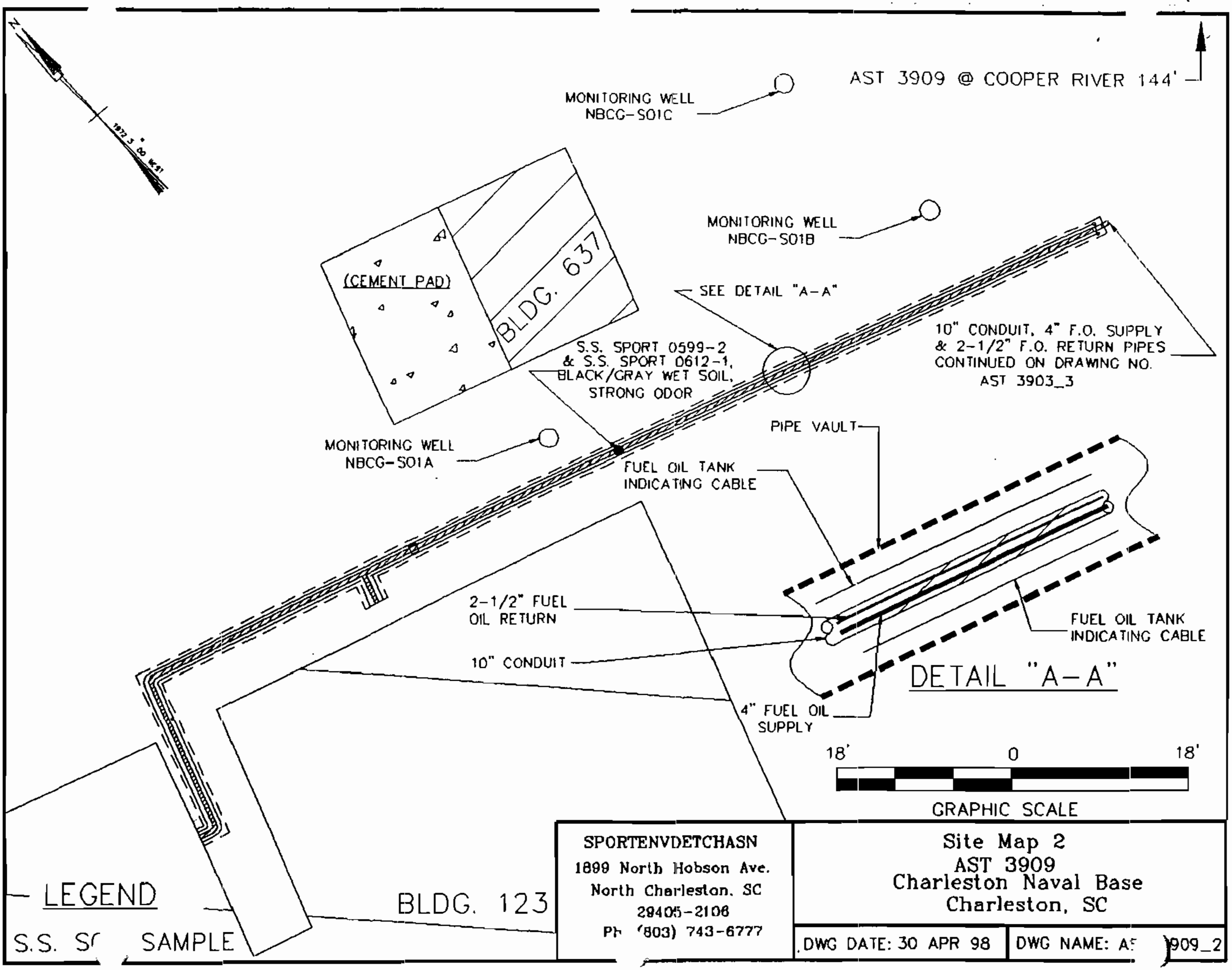


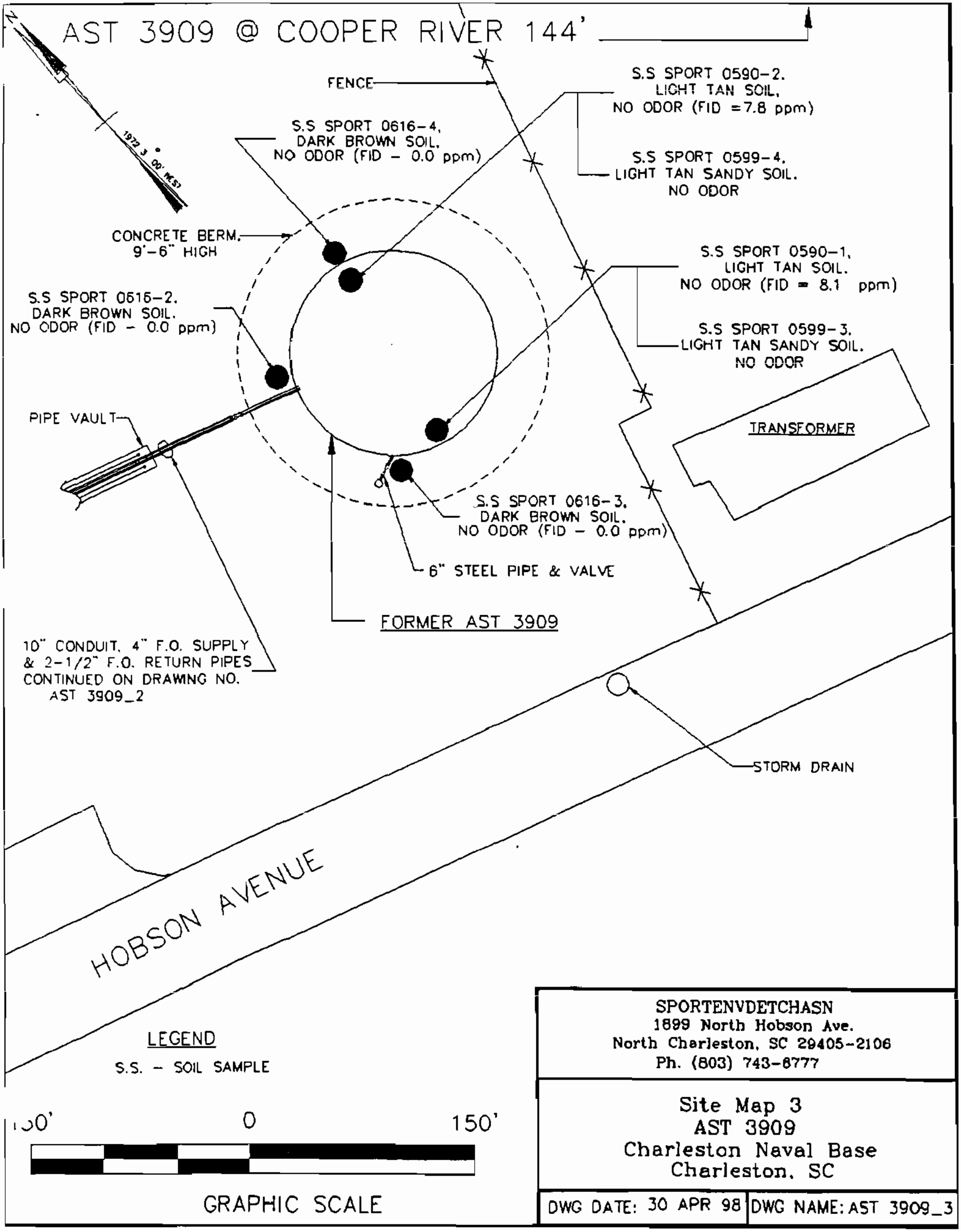


SPORTENVDETCHASN
1899 North Hobson Ave.
North Charleston, SC 29405-2106
Ph. (803) 743-6777

Site Map 1
AST 3909
Charleston Naval Base
Charleston, SC

DWG DATE: 28 APR 98	DWG NAME: AST 3909_1


AST 3909 @ COOPER RIVER 144'
MONITORING WELL
NBCG-S01C
MONITORING WELL
NBCG-S01B
(CEMENT PAD)
BLDG. 637
SEE DETAIL "A-A"
10" CONDUIT, 4" F.O. SUPPLY
& 2-1/2" F.O. RETURN PIPES
CONTINUED ON DRAWING NO.
AST 3903_3
S.S. SPORT 0599-2
& S.S. SPORT 0612-1,
BLACK/GRAY WET SOIL,
STRONG ODOR
MONITORING WELL
NBCG-S01A
PIPE VAULT
FUEL OIL TANK
INDICATING CABLE
2-1/2" FUEL
OIL RETURN
10" CONDUIT
4" FUEL OIL
SUPPLY
FUEL OIL TANK
INDICATING CABLE
DETAIL "A-A"
18'
0
18'
GRAPHIC SCALE
LEGEND
S.S. S SAMPLE
BLDG. 123
SPORTENVDETCHASN
1899 North Hobson Ave.
North Charleston, SC
29405-2106
Ph (803) 743-6777
Site Map 2
AST 3909
Charleston Naval Base
Charleston, SC
DWG DATE: 30 APR 98
DWG NAME: A 909_2


AST 3909 @ COOPER RIVER 144'
FENCE
S.S SPORT 0590-2.
LIGHT TAN SOIL,
NO ODOR (FID =7.8 ppm)
S.S SPORT 0616-4,
DARK BROWN SOIL,
NO ODOR (FID - 0.0 ppm)
S.S SPORT 0599-4,
LIGHT TAN SANDY SOIL,
NO ODOR
CONCRETE BERM,
9'-6" HIGH
S.S SPORT 0590-1,
LIGHT TAN SOIL,
NO ODOR (FID = 8.1 ppm)
S.S SPORT 0616-2,
DARK BROWN SOIL,
NO ODOR (FID - 0.0 ppm)
S.S SPORT 0599-3,
LIGHT TAN SANDY SOIL,
NO ODOR
PIPE VAULT
TRANSFORMER
S.S SPORT 0616-3,
DARK BROWN SOIL,
NO ODOR (FID - 0.0 ppm)
6" STEEL PIPE & VALVE
FORMER AST 3909
10" CONDUIT, 4" F.O. SUPPLY
& 2-1/2" F.O. RETURN PIPES
CONTINUED ON DRAWING NO.
AST 3909_2
STORM DRAIN
HOBSON AVENUE
LEGEND
S.S. - SOIL SAMPLE
150' 0 150'
GRAPHIC SCALE
SPORTENVDETCHASN
1899 North Hobson Ave.
North Charleston, SC 29405-2106
Ph. (803) 743-6777
Site Map 3
AST 3909
Charleston Naval Base
Charleston, SC
DWG DATE: 30 APR 98
DWG NAME: AST 3909_3

AST 3909

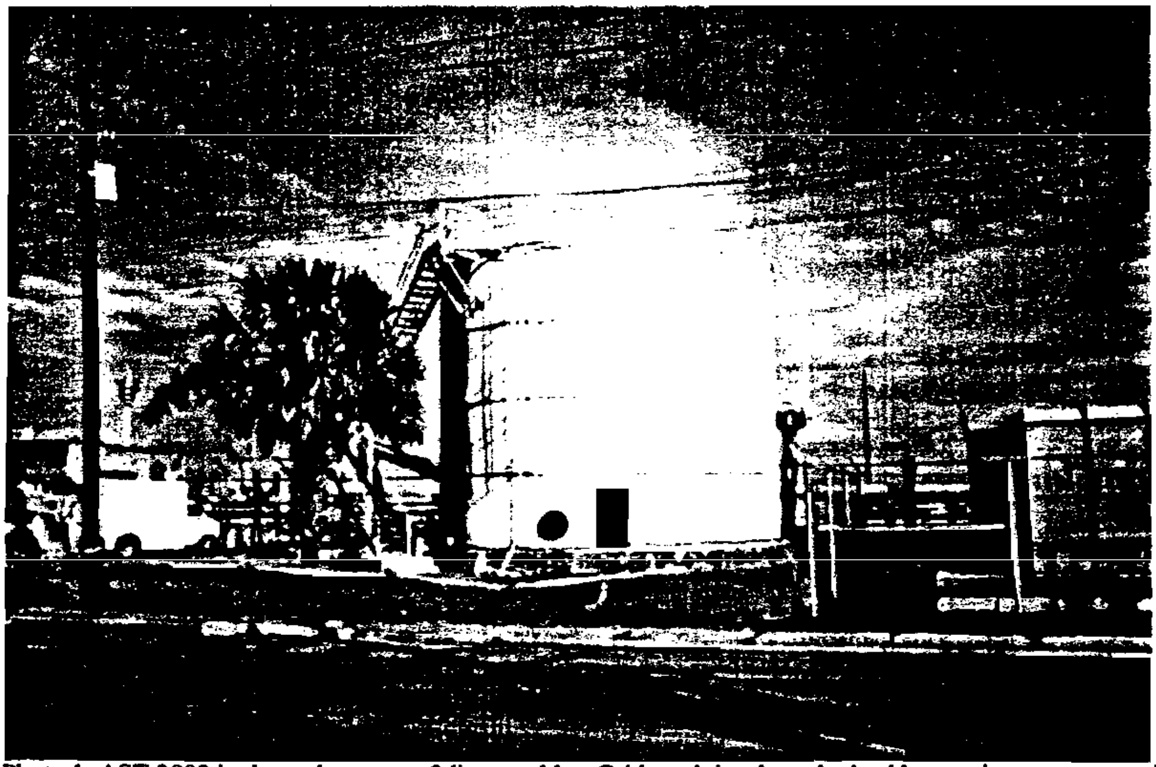


Photo 1: AST 3909 in the early stages of disassembly. Grid work is where the lead base paint was removed prior to cutting.

Photo 2: The last stages of the dismantling operation for the tank.

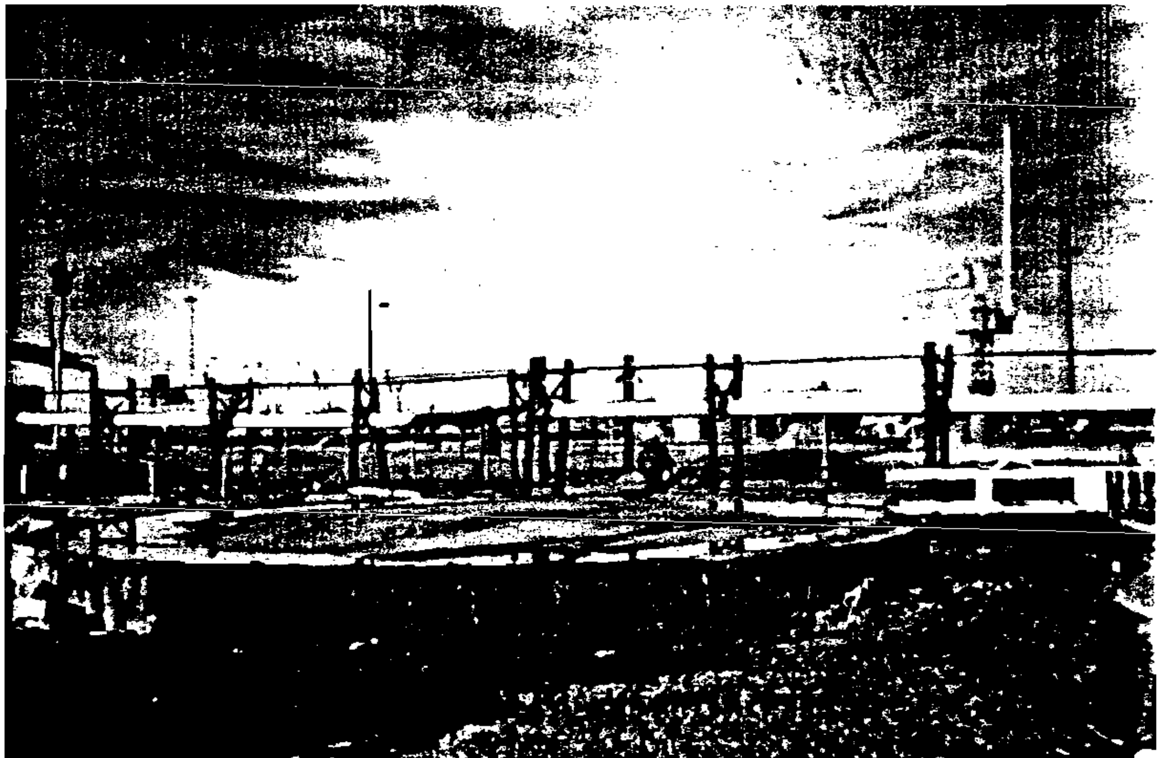


Photo 3: AST 3909 foundation.

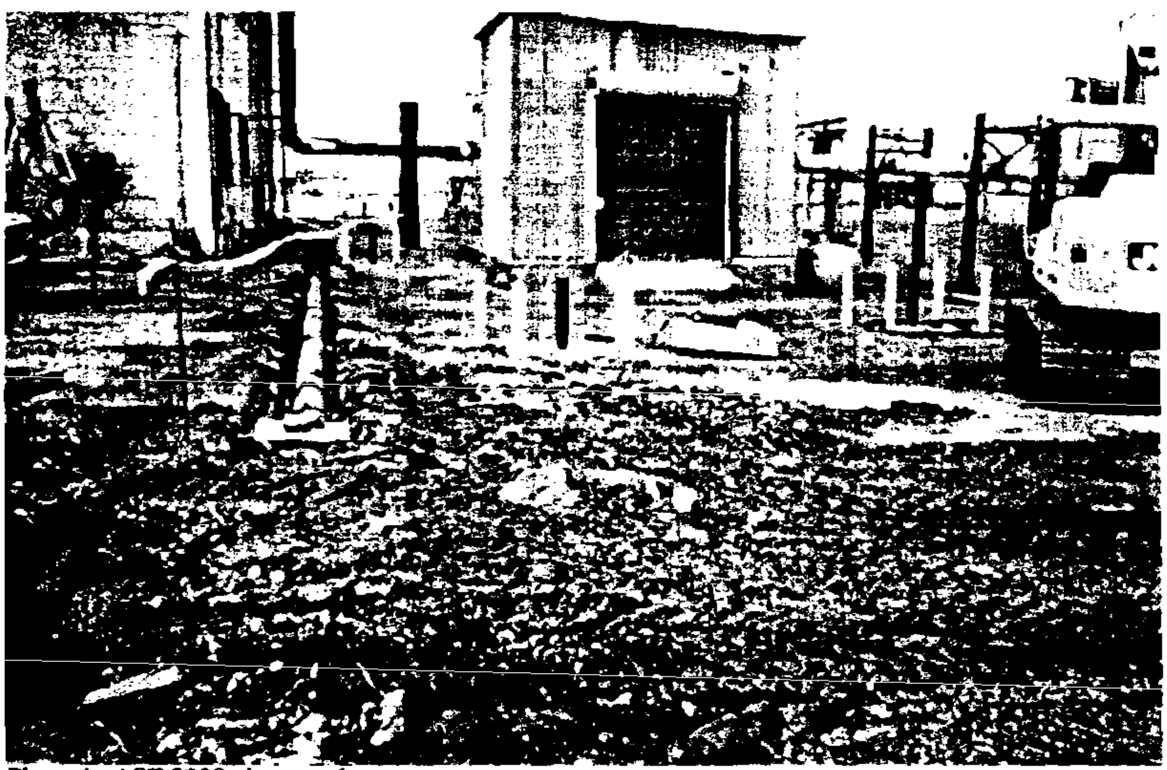


Photo 4: AST 3909 pipe trench.

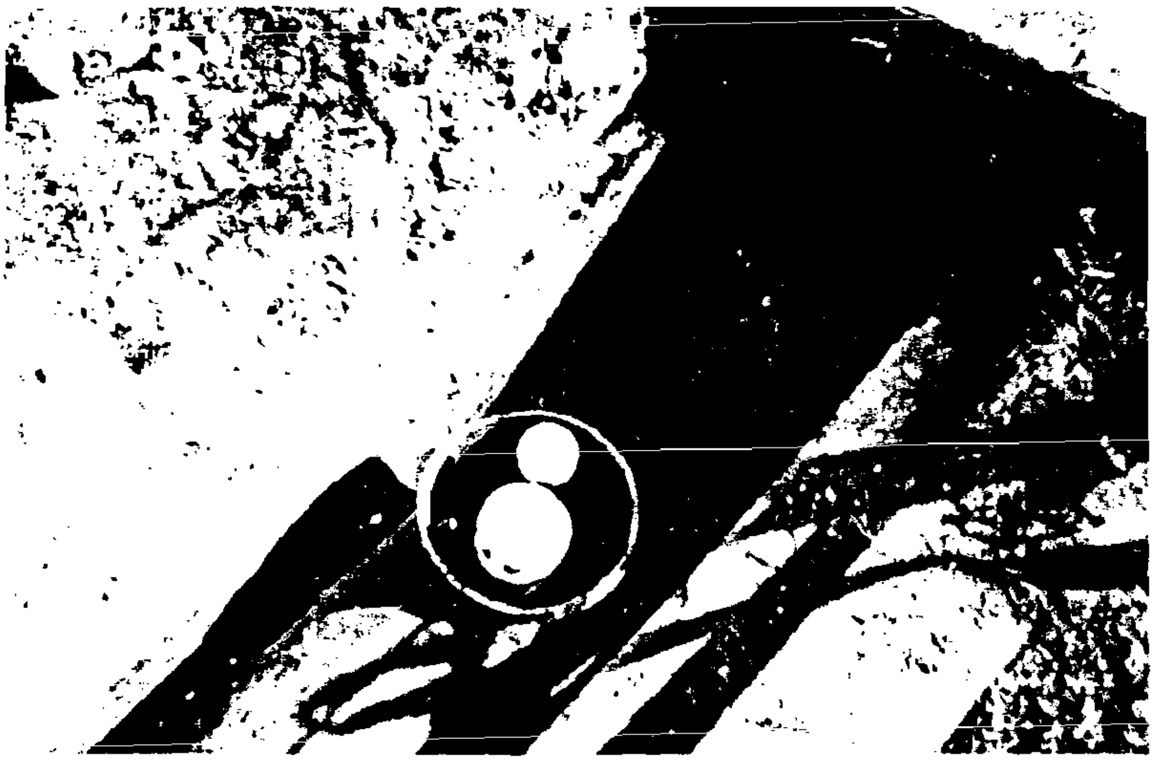


Photo 5: Close-up of AST 3909 pipe trench arrangement.

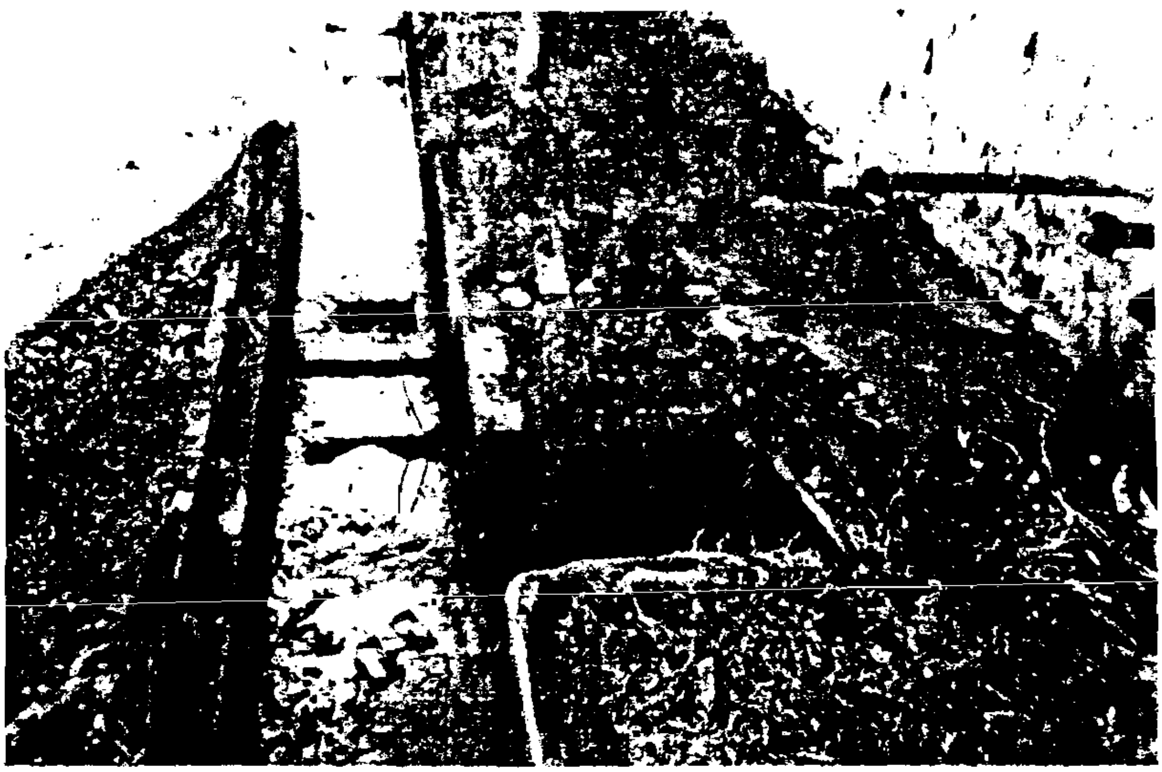


Photo 6: Pipe trench after removal of piping.

Attachment II

ANALYTICAL RESULTS

You must submit the laboratory report and chain-of-custody form for the samples. These samples must be analyzed by a South Carolina certified laboratory.

Certified Analytical Results
Chain-of-Custody

GENERAL ENGINEERING LABORATORIES

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Laboratory Certifications

STATE	GEL	EPI
FL	E87156/87294	E87472/87-
NC	233	
SC	10120	10582
TN	02934	02934

Client:	Supervisor of Ship Building & Conversion SUPSHIP-Portsmouth Detachment-Env. 1899 North Hobson Ave. North Charleston, South Carolina 29405-2106
Contact:	Mr. Bill Hiers
Project Description:	SUPSHIP-Portsmouth Detachment

cc: NPWC00197

Report Date: February 03, 1998

Sample ID	: SPORT0590-1
Lab ID	: 9801495-01
Matrix	: Soil
Date Collected	: 01/21/98
Date Received	: 01/21/98
Priority	: Routine
Collector	: Client

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
Volatile Organics											
BTEX - 4 items											
Benzene	U	0.00	1.00	2.00	ug/kg	1.0	TCL	01/25/98	0308	115192	.
Ethylbenzene	U	0.00	1.00	2.00	ug/kg	1.0					
Toluene	U	0.310	1.00	2.00	ug/kg	1.0					
Xylenes (TOTAL)	U	0.00	1.00	4.00	ug/kg	1.0					
Naphthalene	U	0.00	1.00	2.00	ug/kg	1.0					
General Chemistry											
Total Rec. Petro. Hydrocarbons		262	10.0	50.0	mg/kg	1.0	JLP	01/27/98	1300	115404	2

Surrogate Recovery	Test	Percent%	Acceptable Limits
Bromofluorobenzene	BTEX-8260	97.5	(53.5 - 154.)
Dibromofluoromethane	BTEX-8260	74.0	(63.4 - 136.)
Toluene-d8	BTEX-8260	107.	(72.1 - 137.)
Bromofluorobenzene	NAP-8260	97.5	(53.5 - 154.)
Dibromofluoromethane	NAP-8260	74.0	(63.4 - 136.)
Toluene-d8	NAP-8260	107.	(72.1 - 137.)

M = Method	Method-Description
M 1	EPA 8260
M 2	EPA 9071A

9801495-01

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Laboratory Certifications

STATE	GEL	EPI
FL	E87156/87294	E87472/874
NC	233	
SC	10120	10582
TN	02934	02934

Client:	Supervisor of Ship Building & Conversion SUPSHIP-Portsmouth Detachment-Env. 1899 North Hobson Ave. North Charleston, South Carolina 29405-2106
Contact:	Mr. Bill Hiers
Project Description:	SUPSHIP-Portsmouth Detachment

cc: NPWC00197 Report Date: February 03, 1998

Sample ID : SPORT0590-1

M = Method	Method-Description

Notes:
The qualifiers in this report are defined as follows:
ND indicates that the analyte was not detected at a concentration greater than the detection limit.
J indicates presence of analyte at a concentration less than the reporting limit (RL) and greater than the detection limit (DL).
U indicates that the analyte was not detected at a concentration greater than the detection limit.
* indicates that a quality control analyte recovery is outside of specified acceptance criteria.

This data report has been prepared and reviewed
in accordance with General Engineering Laboratories
standard operating procedures. Please direct
any questions to your Project Manager, Karen Blakeney at (803) 769-7386.

Karen Blakeney
Reviewed By

P O Box 30712 • Charleston. SC 29417 • 2040 Savage Road • 29414
(803) 556-8171 • Fax (803) 766-1178

9801495-01

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Laboratory Certifications

STATE	GEL	EPI
FL	E87156/87294	E87472/i
NC	233	
SC	10120	10582
TN	02934	02934

Client:	Supervisor of Ship Building & Conversion SUPSHIP-Portsmouth Detachment-Env. 1899 North Hobson Ave. North Charleston, South Carolina 29405-2106
Contact:	Mr. Bill Hiers
Project Description:	SUPSHIP-Portsmouth Detachment

cc: NPWC00197

Report Date: February 03, 1998

Sample ID	: SPORT0590-2
Lab ID	: 9801495-02
Matrix	: Soil
Date Collected	: 01/21/98
Date Received	: 01/21/98
Priority	: Routine
Collector	: Client

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
Volatile Organics											
BTEX - 4 items											
Benzene	U	0.00	1.00	2.00	ug/kg	1.0	TCL	01/25/98	0335	115192	
Ethylbenzene	U	0.00	1.00	2.00	ug/kg	1.0					
Toluene	U	0.00	1.00	2.00	ug/kg	1.0					
Xylenes (TOTAL)	U	0.00	1.00	4.00	ug/kg	1.0					
Naphthalene	U	0.680	1.00	2.00	ug/kg	1.0					
General Chemistry											
Total Rec. Petro. Hydrocarbons		183	10.0	50.0	mg/kg	1.0	JLP	01/27/98	1300	115404	2

Comments:

The surrogate recovery for Dibromofluoromethane is outside of the acceptable limits range due to matrix interference.

Surrogate Recovery	Test	Percent%	Acceptable Limits
Bromofluorobenzene	BTEX-8260	101.	(53.5 - 154.)
Dibromofluoromethane	BTEX-8260	20.0*	(63.4 - 136.)
Toluene-d8	BTEX-8260	111.	(72.1 - 137.)
Bromofluorobenzene	NAP-8260	101.	(53.5 - 154.)
Dibromofluoromethane	NAP-8260	20.0*	(63.4 - 136.)
Toluene-d8	NAP-8260	111.	(72.1 - 137.)

M = Method	Method-Description
M 1	EPA 8260

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9801495-02

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Laboratory Certifications

STATE	GEL	EPI
FL	E87156/87294	E87472/E.
NC	233	
SC	10120	10582
TN	02934	02934

Client: Supervisor of Ship Building & Conversion
SUPSHIP-Portsmouth Detachment-Env.
1899 North Hobson Ave.
North Charleston, South Carolina 29405-2106
Contact: Mr. Bill Hiers
Project Description: SUPSHIP-Portsmouth Detachment

cc: NPWC00197 Report Date: February 03, 1998

Sample ID : SPORT0590-2

M = Method	Method-Description
M 2	EPA 9071A

Notes:
The qualifiers in this report are defined as follows:
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ndicates that a quality control analyte recovery is outside of specified acceptance criteria.

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GENERAL ENGINEERING LABORATORIES

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Laboratory Certifications

STATE	GEL	EPI
FL	E87156/87294	E87472/8
NC	233	
SC	10120	10582
TN	02934	02934

Client:	Supervisor of Ship Building & Conversion SUPSHIP-Portsmouth Detachment-Env. 1899 North Hobson Ave. North Charleston, South Carolina 29405-2106
Contact:	Mr. Bill Hiers
Project Description:	SUPSHIP-Portsmouth Detachment

cc: NPWC00197 Report Date: February 03, 1998

Sample ID	: SPORT0590-3
Lab ID	: 9801495-03
Matrix	: Soil
Date Collected	: 01/21/98
Date Received	: 01/21/98
Priority	: Routine
Collector	: Client

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
Volatile Organics											
BTEX - 4 items											
Benzene	U	0.00	1.00	2.00	ug/kg	1.0	TCL	01/25/98	0403	115192	
Ethylbenzene	U	0.00	1.00	2.00	ug/kg	1.0					
Toluene	U	0.00	1.00	2.00	ug/kg	1.0					
Xylenes (TOTAL)	U	0.00	1.00	4.00	ug/kg	1.0					
Naphthalene	U	0.00	1.00	2.00	ug/kg	1.0					

Surrogate Recovery	Test	Percent%	Acceptable Limits
Bromofluorobenzene	BTEX-8260	102.	(53.5 - 154.)
Dibromofluoromethane	BTEX-8260	73.0	(63.4 - 136.)
Toluene-d8	BTEX-8260	110.	(72.1 - 137.)
Bromofluorobenzene	NAP-8260	102.	(53.5 - 154.)
Dibromofluoromethane	NAP-8260	73.0	(63.4 - 136.)
Toluene-d8	NAP-8260	110.	(72.1 - 137.)

M = Method	Method-Description
M 1	EPA 8260

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STATE	GEL	EPI
FL	E87156/87294	E87472/87
NC	233	
SC	10120	10582
TN	02934	02934

Client:	Supervisor of Ship Building & Conversion SUPSHIP-Portsmouth Detachment-Env. 1899 North Hobson Ave. North Charleston, South Carolina 29405-2106
Contact:	Mr. Bill Hiers
Project Description:	SUPSHIP-Portsmouth Detachment

cc: NPWC00197 Report Date: February 03, 1998

Sample ID : SPORT0590-3

M = Method	Method-Description

Notes:
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Karen Blakeney

Reviewed By

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Page 1 of 1

CHAIN OF CUSTODY RECORD

9801495

General Engineering L... ries, Inc.
2040 Savage Road
Charleston, South Carolina 29407
P.O. Box 30712
Charleston, South Carolina 29417
(803) 556-8171

Client Name/Facility Name: SPORTENVDETCHASN

Collected by/Company: SPORTENVDETCHASN

SAMPLE ANALYSIS REQUIRED (x) - use remarks area to specify specific compounds or methods

Use F or P in the boxes to indicate whether sample was filtered and/or preserved

30568

	SAMPLE ID	DATE	TIME	WELL	SOIL	COMP	GRAB	# OF CONTAINERS	pH, conductivity	TOC/DOC	TOX	Chloride, Fluoride, Sulfide	Nitrite/Nitrate	VOC - Specify Method required	METALS - specify	Pesticide	Herbicide	Total Phenol	Acid Extractables	B/N Extractables	PCB's	Cyanide	California - specify type	TPH	BTEX/NAP	Remarks
-01	SPORTOS90-1	1-21-98	0845		✓		✓	2																X	X	AST 3909-1 Soil
-02	SPORTOS90-2	1-21-98	0930		✓		✓	2																X	X	AST 3909-2 Soil
-03	SPORTOS90-3	1-21-98	0800		✓		✓	1																	X	AST 3909-3 Soil / Trip Blank

Relinquished by:	Date:	Time:	Received by:	Relinquished by:	Date:	Time:	Received by:
William [signature]	1-21-98	1115	William W. Smalls	William W. Smalls	1/20/98	14:50	Stephanie Beckelton

Relinquished by:	Date:	Time:	Received by lab by:	Date:	Time:	Remarks:
Stephanie Beckelton	1/21/98	15:20	Dionne Francis	1/21/98	1500	

White = s... e collector Yellow = file Pink = with report

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Laboratory Certifications

STATE	GEL	EPI
FL	E87156/87294	E87472/874!
NC	233	
SC	10120	10582
TN	02934	02934

Client:	Supervisor of Ship Building & Conversion SUPSHIP-Portsmouth Detachment-Env. 1899 North Hobson Ave. North Charleston, South Carolina 29405-2106
Contact:	Mr. Bill Hiers
Project Description:	SUPSHIP-Portsmouth Detachment

cc: NPWC00197 Report Date: March 02, 1998

Sample ID	: SPORT0599-1
Lab ID	: 9802336-01
Matrix	: Soil
Date Collected	: 02/11/98
Date Received	: 02/11/98
Priority	: Routine
Collector	: Client

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
Volatile Organics											
BTEX - 4 items											
zene	U	0.00	1.00	2.00	ug/kg	1.0	RMB	02/20/98	1546	116917	1
..ylbenzene	U	0.00	1.00	2.00	ug/kg	1.0					
Toluene	U	0.222	1.00	2.00	ug/kg	1.0					
Xylenes (TOTAL)	U	0.433	1.00	4.00	ug/kg	1.0					
Naphthalene	U	0.00	1.00	2.00	ug/kg	1.0					

Surrogate Recovery	Test	Percent%	Acceptable Limits
Bromoiluorobenzene	BTEX-8260	115.	(53.5 - 154.)
Dibromofluoromethane	BTEX-8260	85.6	(63.4 - 136.)
Toluene-d8	BTEX-8260	114.	(72.1 - 137.)
Bromofluorobenzene	NAP-8260	115.	(53.5 - 154.)
Dibromofluoromethane	NAP-8260	85.6	(63.4 - 136.)
Toluene-d8	NAP-8260	114.	(72.1 - 137.)

M = Method	Method-Description
M 1	EPA 8260

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9802336-01

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Laboratory Certifications

STATE	GEL	EPI
FL	E87156/87294	E87472/874
NC	233	
SC	10120	10582
TN	02934	02934

Client: Supervisor of Ship Building & Conversion
SUPSHIP-Portsmouth Detachment-Env.
1899 North Hobson Ave.
North Charleston, South Carolina 29405-2106
Contact: Mr. Bill Hiers
Project Description: SUPSHIP-Portsmouth Detachment

cc: NPWC00197 Report Date: March 02, 1998

Sample ID : SPORT0599-1

M = Method **Method-Description**

Notes:
The qualifiers in this report are defined as follows:
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Karen Blakeney
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GENERAL ENGINEERING LABORATORIES

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Laboratory Certifications

STATE	GEL	EPI
FL	E87156/87294	E87472/8742
NC	233	
SC	10120	10582
TN	02934	02934

Client: Supervisor of Ship Building & Conversion
SUPSHIP-Portsmouth Detachment-Env.
1899 North Hobson Ave.
North Charleston, South Carolina 29405-2106

Contact: Mr. Bill Hiers

Project Description: SUPSHIP-Portsmouth Detachment

cc: NPWC00197 Report Date: February 19, 1998

Sample ID	: SPORT0599-2
Lab ID	: 9802336-02
Matrix	: Soil
Date Collected	: 02/11/98
Date Received	: 02/11/98
Priority	: Routine
Collector	: Client

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
Metals Analysis											
Mercury		0.189	0.0151	0.0333	mg/kg	1.0	CRB	02/16/98	1927	116666	N
er		861	61.4	495	ug/kg	2.0	MBL	02/14/98	0910	116609	1
Arsenic		5460	295	495	ug/kg	2.0					
Barium		67600	32.9	495	ug/kg	2.0					
Beryllium	J	245	22.1	495	ug/kg	2.0					
Cadmium		2460	20.6	495	ug/kg	2.0					
Chromium		31300	72.2	495	ug/kg	2.0					
Nickel		193000	225	495	ug/kg	2.0					
Lead		127000	67.1	495	ug/kg	2.0					
Antimony		1400	162	990	ug/kg	2.0					
Selenium		872	138	495	ug/kg	2.0					
General Chemistry											
Total Rec. Petro. Hydrocarbons		8690	10.0	50.0	mg/kg	1.0	JLP	02/17/98	1315	116726	2
Extractable Organic Halides	U	-7.58	3.93	12.2	mg/kg	1.0	LS	02/18/98	1639	116834	3

The following prep procedures were performed:

Mercury	CRB	02/14/98	1600	116666	4
TRACE	FGD	02/13/98	1500	116609	5

M = Method	Method-Description
M 1	EPA 6010A
M 2	EPA 9071A
M 3	GEL
M 4	EPA 7471
	EPA 3050

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Laboratory Certifications

STATE	GEL	EPI
FL	E87156/87294	E87472/87-
NC	233	
SC	10120	10582
TN	02934	02934

Client:	Supervisor of Ship Building & Conversion SUPSHIP-Portsmouth Detachment-Env. 1899 North Hobson Ave. North Charleston, South Carolina 29405-2106
Contact:	Mr. Bill Hiers
Project Description:	SUPSHIP-Portsmouth Detachment

cc: NPWC00197 Report Date: February 19, 1998

Sample ID : SPORT0599-2

M = Method	Method-Description

Notes:
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Laboratory Certifications

STATE	GEL	EPI
FL	E87156/87294	E87472/8745
NC	233	
SC	10120	10582
TN	02934	02934

Client: Supervisor of Ship Building & Conversion
SUPSHIP-Portsmouth Detachment-Env.
1899 North Hobson Ave.
North Charleston, South Carolina 29405-2106
Contact: Mr. Bill Hiers
Project Description: SUPSHIP-Portsmouth Detachment

cc: NPWC00197 Report Date: March 02, 1998

Sample ID	: SPORT0599-3
Lab ID	: 9802336-03
Matrix	: Soil
Date Collected	: 02/11/98
Date Received	: 02/11/98
Priority	: Routine
Collector	: Client

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
Extractable Organics											
'ynuclear Aromatic Hydrocarbons - 16 items											
naphthene	U	0.00	166	331	ug/kg	1.0	JCB	02/20/98	0935	116419	1
Acenaphthylene	U	0.00	166	331	ug/kg	1.0					
Anthracene	U	0.00	166	331	ug/kg	1.0					
Benzo(a)anthracene	U	0.00	166	331	ug/kg	1.0					
Benzo(a)pyrene	U	0.00	166	331	ug/kg	1.0					
Benzo(b)fluoranthene	U	0.00	166	331	ug/kg	1.0					
Benzo(ghi)perylene	U	0.00	166	331	ug/kg	1.0					
Benzo(k)fluoranthene	U	0.00	166	331	ug/kg	1.0					
Chrysene	U	0.00	166	331	ug/kg	1.0					
Dibenzo(a,h)anthracene	U	0.00	166	331	ug/kg	1.0					
Fluoranthene	U	0.00	166	331	ug/kg	1.0					
Fluorene	U	0.00	166	331	ug/kg	1.0					
Indeno(1,2,3-c,d)pyrene	U	0.00	166	331	ug/kg	1.0					
Naphthalene	U	0.00	166	331	ug/kg	1.0					
Phenanthrene	U	0.00	166	331	ug/kg	1.0					
Pyrene	U	0.00	166	331	ug/kg	1.0					

The following prep procedures were performed:

GC/MS Base/Neutral Compounds	RDH	02/12/98	1430	116419	2

Surrogate Recovery	Test	Percent%	Acceptable Limits
2-Fluorobiphenyl	M610	84.8	(30.0 - 115.)
...obenzene-d5	M610	83.1	(23.0 - 120.)
rphenyl-d14	M610	90.5	(37.3 - 128.)

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Laboratory Certifications

STATE	GEL	EPI
FL	E87156/87294	E87472/8
NC	233	
SC	10120	10582
TN	02934	02934

Client:	Supervisor of Ship Building & Conversion SUPSHIP-Portsmouth Detachment-Env. 1899 North Hobson Ave. North Charleston, South Carolina 29405-2106
Contact:	Mr. Bill Hiers
Project Description:	SUPSHIP-Portsmouth Detachment

cc: NPWC00197 Report Date: March 02, 1998

Sample ID : SPORT0599-3

Surrogate Recovery	Test	Percent%	Acceptable Limits

M = Method	Method-Description
M 1	EPA 8270
M 2	EPA 3550

Notes:
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Laboratory Certifications

STATE	GEL	EPI
FL	E87156/87294	E87472/874
NC	233	
SC	10120	10582
TN	02934	02934

Client: Supervisor of Ship Building & Conversion
SUPSHIP-Portsmouth Detachment-Env.
1899 North Hobson Ave.
North Charleston, South Carolina 29405-2106
Contact: Mr. Bill Hiers
Project Description: SUPSHIP-Portsmouth Detachment

cc: NPWC00197 Report Date: March 02, 1998

Sample ID	: SPORT0599-4
Lab ID	: 9802336-04
Matrix	: Soil
Date Collected	: 02/11/98
Date Received	: 02/11/98
Priority	: Routine
Collector	: Client

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
Extractable Organics											
Polynuclear Aromatic Hydrocarbons - 16 items											
Acenaphthene	U	0.00	165	330	ug/kg	1.0	JCB	02/20/98	1008	116419	1
Acenaphthylene	U	0.00	165	330	ug/kg	1.0					
Anthracene	U	0.00	165	330	ug/kg	1.0					
Benzo(a)anthracene	U	0.00	165	330	ug/kg	1.0					
Benzo(a)pyrene	U	0.00	165	330	ug/kg	1.0					
Benzo(b)fluoranthene	U	0.00	165	330	ug/kg	1.0					
Benzo(ghi)perylene	U	0.00	165	330	ug/kg	1.0					
Benzo(k)fluoranthene	U	0.00	165	330	ug/kg	1.0					
Chrysene	U	0.00	165	330	ug/kg	1.0					
Dibenzo(a,h)anthracene	U	0.00	165	330	ug/kg	1.0					
Fluoranthene	U	0.00	165	330	ug/kg	1.0					
Fluorene	U	0.00	165	330	ug/kg	1.0					
Indeno(1,2,3-c,d)pyrene	U	0.00	165	330	ug/kg	1.0					
Naphthalene	U	0.00	165	330	ug/kg	1.0					
Phenanthrene	U	0.00	165	330	ug/kg	1.0					
Pyrene	U	0.00	165	330	ug/kg	1.0					

The following prep procedures were performed:

GC/MS Base/Neutral Compounds RDH 02/12/98 1430 116419 2

Surrogate Recovery	Test	Percent%	Acceptable Limits
2-Fluorobiphenyl	M610	89.8	(30.0 - 115.)
Nitrobenzene-d5	M610	85.8	(23.0 - 120.)
Terphenyl-d14	M610	96.8	(37.3 - 128.)

9802336-04

GENERAL ENGINEERING LABORATORIES
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Laboratory Certifications

STATE	GEL	EPI
FL	E87156/87294	E87472/8
NC	233	
SC	10120	10582
TN	02934	02934

Client: Supervisor of Ship Building & Conversion
SUPSHIP-Portsmouth Detachment-Env.
1899 North Hobson Ave.
North Charleston, South Carolina 29405-2106
Contact: Mr. Bill Hiers
Project Description: SUPSHIP-Portsmouth Detachment

cc: NPWC00197 Report Date: March 02, 1998

Sample ID : SPORT0599-4

Surrogate Recovery	Test	Percent%	Acceptable Limits

M = Method	Method-Description
M 1	EPA 8270
M 2	EPA 3550

Notes:
The qualifiers in this report are defined as follows:
ND indicates that the analyte was not detected at a concentration greater than the detection limit.
J indicates presence of analyte at a concentration less than the reporting limit (RL) and greater than the detection limit (DL).
U indicates that the analyte was not detected at a concentration greater than the detection limit.
* indicates that a quality control analyte recovery is outside of specified acceptance criteria.

This data report has been prepared and reviewed
in accordance with General Engineering Laboratories
standard operating procedures. Please direct
any questions to your Project Manager, Karen Blakeney at (803) 769-7386.

Karen Blakeney
Reviewed By

Charleston, South Carolina 29407
P.O. Box 30712
Charleston, South Caro.   17
(803) 556-8171

CHAIN OF CUS   DY RECORD

9802336

Client Name/Facility Name: SPORTENVDETCHASN

Collected by/Company: SPORTENVDETCHASN

CCL 31313

SAMPLE ANALYSIS REQUIRED (x) use remarks area to specify specific compounds or methods

Use F or P in the boxes to indicate whether sample was filtered and/or preserved

	SAMPLE ID	DATE	TIME	WELL	SOIL	COMP	GRAB	# OF CONTAINERS	pH, conductivity	TOC/DOC	TOX/EOX	Chloride, Fluoride, Sulfide	Nitrite/Nitrate	VOC - Specify Method required	RCRA METALS - specify	BTEX/NAP ~~Pesticides~~	Herbicide	Total Phenol	Acid Extractables	B/N Extractables	PAH ~~PCBs~~	Cyanide	Coliform - specify type	SPLP/...	TOH	Remarks	
-01	SPORT0599-1	2-11-98	0900		✓		✓	1								X										Soil Trip Blank	.1
-02	SPORT0599-2	2-11-98	0940		✓		✓	3			X				X									X	X	Soil AST 3909-4	.2
-03	SPORT0599-3	2-11-98	1005		✓		✓	1													X					Soil AST 3909-5	.3
-04	SPORT0599-4	2-11-98	1025		✓		✓	1													X					Soil AST 3909-6	.3
-05	SPORT0599-5	2-11-98	1045		✓		✓	2								X					X					Soil AST NS6-1	.4
-06	SPORT0599-6	2-11-98	1100		✓		✓	2								X					X					Soil AST NS6-2	.4

Relinquished by:	Date:	Time:	Received by:	Relinquished by:	Date:	Time:	Received by:
[signature]	2-11-98	1320	[signature]	[signature]	2/11/98	1420	[signature]

Relinquished by:	Date:	Time:	Received by lab by:	Date:	Time:	Remarks:
[signature]	2/11/98	1600	Karen Blakeney	2/11/98	1600	

White = sample collector   Yellow = file   Pink = with report

GENERAL ENGINEERING LABORATORIES

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Laboratory Certifications

STATE	GEL	EPI
FL	E87156/87294	E87472/87
NC	233	
SC	10120	10582
TN	02934	02934

Client:	Supervisor of Ship Building & Conversion SUPSHIP-Portsmouth Detachment-Env. 1899 North Hobson Ave. North Charleston, South Carolina 29405-2106
Contact:	Mr. Bill Hiers
Project Description:	SUPSHIP-Portsmouth Detachment

cc: NPWC00197 Report Date: March 11, 1998

Sample ID	: SPORT0612-1
Lab ID	: 9803067-01
Matrix	: TCLP
Date Collected	: 02/11/98
Date Received	: 03/03/98
Priority	: Routine
Collector	: Client

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
Metals Analysis											
Lead	J	23.8	3.39	25.0	ug/l	5.0	MBL	03/06/98	1937	117761	

The following prep procedures were performed:

TCLP Prep for Metals	JL	03/04/98	1505	117610	2

M = Method	Method-Description
M 1	EPA 6010A
M 2	EPA 1311

Notes:
The qualifiers in this report are defined as follows:
ND indicates that the analyte was not detected at a concentration greater than the detection limit.
J indicates presence of analyte at a concentration less than the reporting limit (RL) and greater than the detection limit (DL).
U indicates that the analyte was not detected at a concentration greater than the detection limit.
* indicates that a quality control analyte recovery is outside of specified acceptance criteria.

This data report has been prepared and reviewed
in accordance with General Engineering Laboratories
standard operating procedures. Please direct
any questions to your Project Manager, Karen Blakeney at (803) 769-7386.

Karen Blakeney
Reviewed By

9803067-01

NPI~~00197 SPORT-~012

General Engineering Lab... Inc.
2040 Savage Road
Charleston, South Carolina 29407
P.O. Box 30712
Charleston, South Carolina 29417
(803) 556-8171

CHAIN OF CUSTODY RECORD

9803067

Page 1 of 1

Client Name/Facility Name: SUPSHIP- Env. Detachment

Collected by/Company:

SAMPLE ANALYSIS REQUIRED (x) - use remarks area to specify specific compounds or methods

Use F or P in the boxes to indicate whether sample was filtered and/or preserved

CCL 31605

SAMPLE ID	DATE	TIME	WELL	SOIL	COMP	GRAB	# OF CONTAINERS	pH, conductivity	TOC/DOC	TOX	Chloride, Fluoride, Sulfide	Nitrite/Nitrate	VOC - Specify Method required	METALS - specify	Pesticide	Herbicide	Total Phenol	Acid Extractables	B/N Extractables	PCB's	Cyanide	Coliform - specify type			Remarks
d SPORT 0599-2 R 9802336-02	2/11/98	0940												X											TCLP-Pb .1

Relinquished by:	Date:	Time:	Received by:	Relinquished by:	Date:	Time:	Received by:

Relinquished by:	Date:	Time:	Received by lab by:	Date:	Time:	Remarks:
			[signature]	3/3/98		

White = sample collector Yellow = file Pink = with report

GENERAL ENGINEERING LABORATORIES

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Laboratory Certifications

STATE	GEL	EPI
FL	E87156/87294	E87472/87
NC	233	
SC	10120	10582
TN	02934	02934

Client:	Supervisor of Ship Building & Conversion SUPSHIP-Portsmouth Detachment-Env. 1899 North Hobson Ave. North Charleston, South Carolina 29405-2106
Contact:	Mr. Bill Hiers
Project Description:	SUPSHIP-Portsmouth Detachment

cc: NPWC00197 Report Date: March 23, 1998

Sample ID	: SPORT0616-1
Lab ID	: 9803208-01
Matrix	: Soil
Date Collected	: 03/09/98
Date Received	: 03/10/98
Priority	: Routine
Collector	: Client

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
Volatile Organics											
BTEX - 4 items											
Benzene	U	0.00	1.00	2.00	ug/kg	1.0	JEB	03/18/98	1747	118575	
Ethylbenzene	U	0.00	1.00	2.00	ug/kg	1.0					
Toluene	U	0.00	1.00	2.00	ug/kg	1.0					
Xylenes (TOTAL)	U	0.00	1.00	4.00	ug/kg	1.0					
Naphthalene	U	0.00	1.00	2.00	ug/kg	1.0					

Surrogate Recovery	Test	Percent%	Acceptable Limits
Bromofluorobenzene	BTEX-8260	99.7	(53.5 - 154.)
Dibromofluoromethane	BTEX-8260	97.6	(63.4 - 136.)
Toluene-d8	BTEX-8260	97.2	(72.1 - 137.)
Bromofluorobenzene	NAP-8260	99.7	(53.5 - 154.)
Dibromofluoromethane	NAP-8260	97.6	(63.4 - 136.)
Toluene-d8	NAP-8260	97.2	(72.1 - 137.)

M = Method	Method-Description
M 1	EPA 8260

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Laboratory Certifications

STATE	GEL	EPI
FL	E87156/87294	E87472/87-
NC	233	
SC	10120	10582
TN	02934	02934

Client:	Supervisor of Ship Building & Conversion SUPSHIP-Portsmouth Detachment-Env. 1899 North Hobson Ave. North Charleston, South Carolina 29405-2106
Contact:	Mr. Bill Hiers
Project Description:	SUPSHIP-Portsmouth Detachment

cc: NPWC00197 Report Date: March 23, 1998

Sample ID : SPORT0616-1

M = Method	Method-Description

Notes:
The qualifiers in this report are defined as follows:
ND indicates that the analyte was not detected at a concentration greater than the detection limit.
J indicates presence of analyte at a concentration less than the reporting limit (RL) and greater than the detection limit (DL).
U indicates that the analyte was not detected at a concentration greater than the detection limit.
* indicates that a quality control analyte recovery is outside of specified acceptance criteria.

..s data report has been prepared and reviewed in accordance with General Engineering Laboratories standard operating procedures. Please direct any questions to your Project Manager, Karen Blakeney at (803) 769-7386.

Karen Blakeney

Reviewed By

P O Box 30712 • Charleston, SC 29417 • 2040 Savage Road • 29414

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9803208-01

GENERAL ENGINEERING LABORATORIES

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Laboratory Certifications

STATE	GEL	EPI
FL	E87156/87294	E87472/874
NC	233	
SC	10120	10582
TN	02934	02934

Client: Supervisor of Ship Building & Conversion
SUPSHIP-Portsmouth Detachment-Env.
1899 North Hobson Ave.
North Charleston, South Carolina 29405-2106

Contact: Mr. Bill Hiers

Project Description: SUPSHIP-Portsmouth Detachment

cc: NPWC00197

Report Date: March 23, 1998

Sample ID	: SPORT0616-2
Lab ID	: 9803208-02
Matrix	: Soil
Date Collected	: 03/09/98
Date Received	: 03/10/98
Priority	: Routine
Collector	: Client

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
Volatile Organics											
BTEX - 4 items											
Benzene	U	0.00	1.00	2.00	ug/kg	1.0	JEB	03/18/98	2001	118575	:
Ethylbenzene	U	0.00	1.00	2.00	ug/kg	1.0					
Toluene	U	0.00	1.00	2.00	ug/kg	1.0					
Xylenes (TOTAL)	U	0.00	1.00	4.00	ug/kg	1.0					
Naphthalene	U	0.00	1.00	2.00	ug/kg	1.0					
Extractable Organics											
Polynuclear Aromatic Hydrocarbons - 16 items											
Acenaphthene	U	0.00	4900	9800	ug/kg	10.	RLC	03/16/98	2206	118154	2
Acenaphthylene	U	0.00	4900	9800	ug/kg	10.					
Anthracene	U	0.00	4900	9800	ug/kg	10.					
Benzo(a)anthracene	U	0.00	4900	9800	ug/kg	10.					
Benzo(a)pyrene	U	0.00	4900	9800	ug/kg	10.					
Benzo(b)fluoranthene	U	0.00	4900	9800	ug/kg	10.					
Benzo(ghi)perylene	U	0.00	4900	9800	ug/kg	10.					
Benzo(k)fluoranthene	U	0.00	4900	9800	ug/kg	10.					
Chrysene	U	0.00	4900	9800	ug/kg	10.					
Dibenzo(a,h)anthracene	U	0.00	4900	9800	ug/kg	10.					
Fluoranthene	U	0.00	4900	9800	ug/kg	10.					
Fluorene	U	0.00	4900	9800	ug/kg	10.					
Indeno(1,2,3-c,d)pyrene	U	0.00	4900	9800	ug/kg	10.					
Naphthalene	U	0.00	4900	9800	ug/kg	10.					
Phenanthrene	U	0.00	4900	9800	ug/kg	10.					
Pyrene	U	0.00	4900	9800	ug/kg	10.					

The following prep procedures were performed:

GC/MS Base/Neutral Compounds — MAL 03/13/98 1120 118154 3

9803208-02

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Laboratory Certifications

STATE	GEL	EPI
FL	E87156/87294	E87472/874
NC	233	
SC	10120	10582
TN	02934	02934

Client: Supervisor of Ship Building & Conversion
SUPSHIP-Portsmouth Detachment-Env.
1899 North Hobson Ave.
North Charleston, South Carolina 29405-2106
Contact: Mr. Bill Hiers
Project Description: SUPSHIP-Portsmouth Detachment

cc: NPWC00197 Report Date: March 23, 1998

Sample ID : SPORT0616-2

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M

Comments:
A dilution was required for Extractable Organics due to matrix interference. As a result. the detection limits are elevated.

Surrogate Recovery	Test	Percent%	Acceptable Limits
ˀ Fluorobiphenyl	M610	0.00*	(30.0 - 115.)
obenzene-d5	M610	0.00*	(23.0 - 120.)
p-Terphenyl-d14	M610	0.00*	(37.3 - 128.)
Bromofluorobenzene	BTEX-8260	76.3	(53.5 - 154.)
Dibromofluoromethane	BTEX-8260	106.	(63.4 - 136.)
Toluene-d8	BTEX-8260	114.	(72.1 - 137.)
Bromofluorobenzene	NAP-8260	76.3	(53.5 - 154.)
Dibromofluoromethane	NAP-8260	106.	(63.4 - 136.)
Toluene-d8	NAP-8260	114.	(72.1 - 137.)

M = Method	Method-Description
M 1	EPA 8260
M 2	EPA 8270
M 3	EPA 3550

Notes:
The qualifiers in this report are defined as follows:
ND indicates that the analyte was not detected at a concentration greater than the detection limit.
J indicates presence of analyte at a concentration less than the reporting limit (RL) and greater than the detection limit (DL).
U indicates that the analyte was not detected at a concentration greater than the detection limit.
* indicates that a quality control analyte recovery is outside of specified acceptance criteria.

GENERAL ENGINEERING LABORATORIES
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Laboratory Certifications

STATE	GEL	EPI
FL	E87156/87294	E87472/87
NC	233	
SC	10120	10582
TN	02934	02934

Client: Supervisor of Ship Building & Conversion
SUPSHIP-Portsmouth Detachment-Env.
1899 North Hobson Ave.
North Charleston, South Carolina 29405-2106

Contact: Mr. Bill Hiers

Project Description: SUPSHIP-Portsmouth Detachment

cc: NPWC00197 Report Date: March 23, 1998

Sample ID : SPORT0616-2

M = Method	Method-Description

This data report has been prepared and reviewed
in accordance with General Engineering Laboratories
standard operating procedures. Please direct
any questions to your Project Manager, Karen Blakeney at (803) 769-7386.

Karen Blakeney

Reviewed By

9803208-02

GENERAL ENGINEERING LABORATORIES

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Laboratory Certifications

STATE	GEL	EPI
FL	E87156/87294	E87472/87
NC	233	
SC	10120	10582
TN	02934	02934

Client:	Supervisor of Ship Building & Conversion SUPSHIP-Portsmouth Detachment-Env. 1899 North Hobson Ave. North Charleston, South Carolina 29405-2106
Contact:	Mr. Bill Hiers
Project Description:	SUPSHIP-Portsmouth Detachment

cc: NPWC00197 Report Date: March 23, 1998

Sample ID	: SPORT0616-3
Lab ID	: 9803208-03
Matrix	: Soil
Date Collected	: 03/09/98
Date Received	: 03/10/98
Priority	: Routine
Collector	: Client

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
Volatile Organics											
BTEX - 4 items											
zene	U	0.00	1.00	2.00	ug/kg	1.0	JEB	03/19/98	1447	118575	
ylbenzene	U	0.00	1.00	2.00	ug/kg	1.0					
Toluene	U	0.00	1.00	2.00	ug/kg	1.0					
Xylenes (TOTAL)	U	0.00	1.00	4.00	ug/kg	1.0					
Naphthalene	U	0.00	1.00	2.00	ug/kg	1.0					
Extractable Organics											
Polynuclear Aromatic Hydrocarbons - 16 items											
Acenaphthene	U	0.00	165	330	ug/kg	1.0	RLC	03/16/98	2238	118154	2
Acenaphthylene	U	0.00	165	330	ug/kg	1.0					
Anthracene	U	0.00	165	330	ug/kg	1.0					
Benzo(a)anthracene	U	0.00	165	330	ug/kg	1.0					
Benzo(a)pyrene	U	0.00	165	330	ug/kg	1.0					
Benzo(b)fluoranthene	U	0.00	165	330	ug/kg	1.0					
Benzo(ghi)perylene	U	0.00	165	330	ug/kg	1.0					
Benzo(k)fluoranthene	U	0.00	165	330	ug/kg	1.0					
Chrysene	U	0.00	165	330	ug/kg	1.0					
Dibenzo(a,h)anthracene	U	0.00	165	330	ug/kg	1.0					
Fluoranthene	U	0.00	165	330	ug/kg	1.0					
Fluorene	U	0.00	165	330	ug/kg	1.0					
Indeno(1,2,3-c,d)pyrene	U	0.00	165	330	ug/kg	1.0					
Naphthalene	U	0.00	165	330	ug/kg	1.0					
Phenanthrene	U	0.00	165	330	ug/kg	1.0					
Pyrene	U	0.00	165	330	ug/kg	1.0					

following prep procedures were performed:

MS Base/Neutral Compounds MAL 03/13/98 1120 118154 3

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9803208-03

GENERAL ENGINEERING LABORATORIES

Meeting today's needs with a vision for tomorrow.

Laboratory Certifications

STATE	GEL	EPI
FL	E87156/87294	E87472/87.
NC	233	
SC	10120	10582
TN	02934	02934

Client: Supervisor of Ship Building & Conversion
SUPSHIP-Portsmouth Detachment-Env.
1899 North Hobson Ave.
North Charleston, South Carolina 29405-2106

Contact: Mr. Bill Hiers

Project Description: SUPSHIP-Portsmouth Detachment

cc: NPWC00197 Report Date: March 23, 1998

Sample ID : SPORT0616-3

Surrogate Recovery	Test	Percent%	Acceptable Limits
2-Fluorobiphenyl	M610	64.3	(30.0 - 115.)
Nitrobenzene-d5	M610	55.7	(23.0 - 120.)
p-Terphenyl-d14	M610	100.	(37.3 - 128.)
Bromofluorobenzene	BTEX-8260	80.0	(53.5 - 154.)
Dibromofluoromethane	BTEX-8260	68.3	(63.4 - 136.)
Toluene-d8	BTEX-8260	113.	(72.1 - 137.)
Bromofluorobenzene	NAP-8260	80.0	(53.5 - 154.)
Dibromofluoromethane	NAP-8260	68.3	(63.4 - 136.)
Toluene-d8	NAP-8260	113.	(72.1 - 137.)

M = Method	Method-Description
M 1	EPA 8260
M 2	EPA 8270
M 3	EPA 3550

Notes:
The qualifiers in this report are defined as follows:
ND indicates that the analyte was not detected at a concentration greater than the detection limit.
J indicates presence of analyte at a concentration less than the reporting limit (RL) and greater than the detection limit (DL).
U indicates that the analyte was not detected at a concentration greater than the detection limit.
* indicates that a quality control analyte recovery is outside of specified acceptance criteria.

This data report has been prepared and reviewed in accordance with General Engineering Laboratories standard operating procedures. Please direct any questions to your Project Manager, Karen Blakeney at (803) 769-7386.

Karen Blakeney
Reviewed By

GENERAL ENGINEERING LABORATORIES
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Laboratory Certifications

STATE	GEL	EPI
FL	E87156/87294	E87472/8745
NC	233	
SC	10120	10582
TN	02934	02934

Client: Supervisor of Ship Building & Conversion
SUPSHIP-Portsmouth Detachment-Env.
1899 North Hobson Ave.
North Charleston, South Carolina 29405-2106

Contact: Mr. Bill Hiers

Project Description: SUPSHIP-Portsmouth Detachment

cc: NPWC00197

Report Date: March 23, 1998

Sample ID : SPORT0616-4
Lab ID : 9803208-04
Matrix : Soil
Date Collected : 03/09/98
Date Received : 03/10/98
Priority : Routine
Collector : Client

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
Volatile Organics											
BTEX - 4 items											
...ne	U	0.00	1.00	2.00	ug/kg	1.0	JEB	03/18/98	2215	118575	1
...ylbenzene	U	0.00	1.00	2.00	ug/kg	1.0					
Toluene	U	0.00	1.00	2.00	ug/kg	1.0					
Xylenes (TOTAL)	U	0.00	1.00	4.00	ug/kg	1.0					
Naphthalene	U	0.00	1.00	2.00	ug/kg	1.0					
Extractable Organics											
Polynuclear Aromatic Hydrocarbons - 16 items											
Acenaphthene	U	0.00	166	331	ug/kg	1.0	RLC	03/16/98	2309	118154	2
Acenaphthylene	U	0.00	166	331	ug/kg	1.0					
Anthracene	U	0.00	166	331	ug/kg	1.0					
Benzo(a)anthracene	J	173	166	331	ug/kg	1.0					
Benzo(a)pyrene		349	166	331	ug/kg	1.0					
Benzo(b)fluoranthene		358 [illegible]	166	331	ug/kg	1.0					
Benzo(ghi)perylene	J	251	166	331	ug/kg	1.0					
Benzo(k)fluoranthene	U	0.00	166	331	ug/kg	1.0					
Chrysene	J	195	166	331	ug/kg	1.0					
Dibenzo(a,h)anthracene	U	0.00	166	331	ug/kg	1.0					
Fluoranthene	U	0.00	166	331	ug/kg	1.0					
Fluorene	U	0.00	166	331	ug/kg	1.0					
Indeno(1,2,3-c,d)pyrene	J	208	166	331	ug/kg	1.0					
Naphthalene	U	0.00	166	331	ug/kg	1.0					
Phenanthrene	U	0.00	166	331	ug/kg	1.0					
Pyrene	U	0.00	166	331	ug/kg	1.0					

T... following prep procedures were performed:

...s Base/Neutral Compounds — MAL 03/13/98 1120 118154 3

9803208-04

GENERAL ENGINEERING LABORATORIES

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Laboratory Certifications

STATE	GEL	EPI
FL	E87156/87294	E87472/874
NC	233	
SC	10120	10582
TN	02934	02934

Client: Supervisor of Ship Building & Conversion
SUPSHIP-Portsmouth Detachment-Env.
1899 North Hobson Ave.
North Charleston, South Carolina 29405-2106
Contact: Mr. Bill Hiers
Project Description: SUPSHIP-Portsmouth Detachment

cc: NPWC00197 Report Date: March 23, 1998

Sample ID : SPORT0616-4

Surrogate Recovery	Test	Percent%	Acceptable Limits
2-Fluorobiphenyl	M610	69.9	(30.0 - 115.)
Nitrobenzene-d5	M610	58.4	(23.0 - 120.)
p-Terphenyl-d14	M610	111.	(37.3 - 128.)
Bromofluorobenzene	BTEX-8260	89.7	(53.5 - 154.)
Dibromofluoromethane	BTEX-8260	107.	(63.4 - 136.)
Toluene-d8	BTEX-8260	107.	(72.1 - 137.)
Bromofluorobenzene	NAP-8260	89.7	(53.5 - 154.)
Dibromofluoromethane	NAP-8260	107.	(63.4 - 136.)
Toluene-d8	NAP-8260	107.	(72.1 - 137.)

M = Method	Method-Description
M 1	EPA 8260
M 2	EPA 8270
M 3	EPA 3550

Notes:
The qualifiers in this report are defined as follows:
ND indicates that the analyte was not detected at a concentration greater than the detection limit.
J indicates presence of analyte at a concentration less than the reporting limit (RL) and greater than the detection limit (DL).
U indicates that the analyte was not detected at a concentration greater than the detection limit.
* indicates that a quality control analyte recovery is outside of specified acceptance criteria.

This data report has been prepared and reviewed in accordance with General Engineering Laboratories standard operating procedures. Please direct any questions to your Project Manager, Karen Blakeney at (803) 769-7386.

Karen Blakeney
Reviewed By

9803208-04

General Engineering Lab
2040 Savage Road
Charleston, South Carolina 29407
P.O. Box 30712
Charleston, South Carolina 29417
(803) 556 8171

CHAIN OF CUSTODY RECORD

9803208

Client Name/Facility Name: [illegible]

Collected by/Company: SPORTENBURG/NORTHMAN [illegible]

SAMPLE ANALYSIS REQUIRED (x) - use remarks area to specify specific compounds or methods

Use F or P in the boxes to indicate whether sample was filtered and/or preserved

CCL 31697

	SAMPLE ID	DATE	TIME	WELL	SOIL	COMP	GRAB	# OF CONTAINERS	pH, conductivity	TOC/DOC	TOX	Chloride, Fluoride, Sulfide	Nitrite/Nitrate	VOC - Specify Method required	METALS - specify	Pesticide	Herbicide	Total Phenol	Acid Extractables	B/N Extractables	PCB's	Cyanide	Coliform - specify type	BTEX/MTBE	PAH	Remarks	
01	[illegible] 1	3/9/98	0850		✓		✓	1																X		A57 39.9-8 Soil [illegible]	.1
02	[illegible] 2	3/9/98	0950		✓		✓	2																X	X	A57 39.4-[illegible] Soil	.2
03	[illegible] 3	3/9/98	1025		✓		✓	2																X	X	A[illegible] 39.[illegible]-10 Soil	.2
04	[illegible] 4	3/9/98	1059		✓		✓	2																X	X	A[illegible] 39.[illegible]-11 Soil	.2

Relinquished by:	Date:	Time:	Received by:	Relinquished by:	Date:	Time:	Received by:
William [illegible]	3/9/98	1520	W.R. [illegible]	W.R. [illegible] Jr.	3/10/98	1114	Catharine [illegible]

Relinquished by:	Date:	Time:	Received by lab by:	Date:	Time:	Remarks:
Catharine [illegible]	3/10/98	1435	Karen Blakeney	3/10/98	1435	

White = sample collector Yellow = file Pink = with report

Attachment III

Certificate of Disposal (tank)
Disposal Manifests

AST Certificate of Disposal

CONTRACTOR

Supervisor of Shipbuilding, Conversion and Repair, USN
Portsmouth, VA
Environmental Detachment Charleston
1899 North Hobson Avenue
North Charleston 29405-2106

Telephone (803) 743-6482

TANK ID & LOCATION

AST 3909, South Hobson Ave., N. Charleston, SC

DISPOSAL LOCATION

Bldg. 1601 Tank Cleaning
& Disposal Area
Charleston Naval Complex

TYPE OF TANK	SIZE (GAL)
Fuel Oil	200,000 gal.

CLEANING/DISPOSAL METHOD

The tank was cleaned with a steam cleaner, cut into sections, and disposed of as recyclable scrap metal.

DISPOSAL CERTIFICATION

I certify that the above tank has been properly cleaned and disposed of as recyclable scrap metal.

John Amey — 4/28/98
John Amey (Date)

GENERATOR PROFILE SHEET

PLEASE PRINT IN INK OR TYPE

NATIONSWASTE, INC.
P. O. BOX 90723
COLUMBIA, SC 29290
1581 WESTVACO ROAD
EASTOVER, SC 29044
Phone: 803-353-0563 Fax: 803-353-0519

Internal Use Only

Special Waste Profile Number ______

Expiration Date: __/__/__

A. GENERATOR INFORMATION

Generator: CHARLESTON NAVAL COMPLEX
Physical Address: 1899 N. HOBSON
City, State, Zip: N. CHARLESTON, SC 29405
Billing Address (If different from Physical): PENN-VAC, INC, PO BOX 62679
City, State, Zip: N. CHARLESTON, SC 29419
Contact Name: TODD DAILEY Title: ______
Telephone Number: (803) 743-6777-224 Fax Number: (803) 743-9413
EPA ID Number: N/A
County: CHARLESTON Generator SIC Code: N/A

B. WASTE DESCRIPTION (See Instructions)

Name of Waste: #2 & #6 oil sludge, virgin
Original Process Generating Waste: sludge build-up in tank

Category: Type I Special Waste ______ Type II Special Waste ______
Estimated Volume: 30 tons
Special Handling Instructions/Supplemental Information ______

CONSTITUENT	RANGE (Must total at least 100%)	CONSTITUENT	RANGE (Must total at least 100%)
#2 & #6 sludge	50 - 75 %		- %
Cement Kiln dust	25 - 50 %		- %
	- %		- %
	- %		- %
	- %		- %
	- %		- %
	- %		- %

Does the Waste Contain any of the following?

	NO	YES	ACTUAL (If you checked yes)
PCBs	X		ppm
Cyanides	X		ppm
Sulfides	X		ppm

C. PHYSICAL PROPERTIES

Color(s)	Odor (Check One)	Physical State @70°F
Brown to Grey	__ None X Mild __ Strong Describe: Petroleum	__ Liquid __ Semi Solid __ Powder __ Sludge X Solid Other: ______

Specific Gravity: N/A (Can use range)	Layers: X Single __ Bi-layered __ Mutiple # ___	Free Liquids: __ Yes X No (If Yes, then) Volume ___

pH: ≤2 >2-<4 X 4-10 >10-<12.5 ≥12.5 N/A

Flash Point: <73°F 73°-99°F 100°-139°F 140°-199°F ≥200°F X N.A Closed Cup Open Cup

D. TRANSPORTATION INFORMATION

Method of shipment: ___ Bulk Liquid ___ Bulk Sludge X Bulk Solid ___ Drum/Box ___ Other ___

Supplemental Shipping Information: N/A

Is this a DOT hazardous Material? X No ___ Yes (If yes, complete the following information)

DOT Proper Shipping Name Non Regulated

Technical Name(s) (if applicable) N/A

Hazard Class or Division N/A Identification Number N/A

Packing Group N/A Reportable Quantity (RQ) (Pounds or Kilograms) N/A

Table Label N/A

Emergency Response Contact N/A

24 Hour Emergency Phone # N/A Emergency Guide Book Page # N/A

E. GENERATOR CERTIFICATION

I hereby certify that the information contained in this profile is accurate and true. All relevant information regarding known or suspected hazards in the possession of the Generator have been disclosed. All types and amounts of special wastes provided in incidental amounts have been identified in Section B of this form

This waste is not a "Hazardous Waste" as defined by USEPA and/or the state regulations.

This waste *does not* contain any of the following:

a. Regulated radioactive materials.
b. Regulated concentrations of PCB's (Polychlorinated Biphenyl's).
c. > 5,000 ppm of TPH (Total Petroleum Hydrocarbon) from Gas, Diesel or PAH (Polynuclear Aromatic Hydrocarbons) Compounds.
d. > 100 ppm of BTEX (Benzene/Toluene/Ethylbenzene/Xylene).

This material tested below the maximum concentration of contaminants for the toxicity characteristics as specified in the EPA 40 CFR Part 261.24 and for waste being disposed of in SC as specified in South Carolina Hazardous Waste Management Regulations (R61-79.261.24).

The attached analytical data (if any) was derived from a representative sample obtained according to the sampling methods specified in EPA 40 CFR 261.20 (c) or an equivalent method.

If any changes occur in the character of the waste, the Generator shall notify NationsWaste, Inc. at the Northeast Sanitary Landfill prior to providing the waste to NationsWaste, Inc. at the Northeast Sanitary Landfill.

The information provided is based on: (check one or more)

___ Lab Analysis (please attach) ___ MSDS (please attach) X Knowledge of Waste

___ Other: Explain ___

Todd M. Dailey
Generator's Authorized Signatory

WASTE MANAGER
Title

TODD M DAILEY
Printed Name

May 14, 1997
Date

GIANT CEMENT COMPANY
Post Office Box 218
Harleyville, South Carolina 29448

Plant:
(803) 496-5033

Fax:
(803) 496-7573

CERTIFICATE OF MATERIALS REUSE

June 12, 1997

This certificate is to serve as evidence of total reuse of solvents and/or waste oil received from your company as follows:

	DATE	MAN NO	QUANTITY	POUNDS
F0584				
U. S. Navy-Charleston Env. Detach				
	97/05/23	52297	3762.00	30820.00
	97/05/27	52197	4274.00	33040.00
TOTAL	2		**8036.00**	**63860.00**

This material was used as a fuel in our rotary cement kilns, resulting in its complete destruction, and this meets all requirements as defined in 40 CFR Part 268, Subpart D.

Very truly yours,

Donna M. Davis
Facility Sales Manager

DMD/ssb

cc: Grr!

APPENDIX B

GEOLOGIC BORING LOGS

BORING LOG

PROJECT NAME: CNC Zone G / Site 19
BORING NUMBER: CNC 19 B01
PROJECT NUMBER: 0124
DATE: 4/27/99
DRILLING COMPANY: Tidewater
GEOLOGIST: Ry Horze
DRILLING RIG: Geoprobe
DRILLER: Pete Miller

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
	0					red brn	Grass @ sfc			0/0	0		0
			2.3'/3'		loose		Silt, sandy,		sl. moist				
	3					tan	angular rx frags @ top		18FB0103				
									moist @ top	0/0	0		0
			1.7'/3'			red	Silt, sandy, w/						
	6					gray	rx frags		wet				

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Remarks:

Drilling Area Background (ppm):

Converted to Well: Yes ____ No ____ Well I.D. #:

BORING LOG

PROJECT NAME: CNC - ZONE G
BORING NUMBER: CNC18-B002
PROJECT NUMBER:
DATE: 7-29-99
DRILLING COMPANY: TIDEWATER
GEOLOGIST: SISCO
DRILLING RIG: F-250 w/ 5400
DRILLER: M. COLEMAN

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS*	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
	0												
	1				V Soft	Lt Brown	SILTY, SAND & GRAVEL		DRY	2			
	2				V.Soft	"	" " "		DRY	2			
	3				Soft	Lt GRAY,	Silty Org. Clay		Moist	2			
X	4		4		Soft	"	" " "		Moist to Wet	2			
X	5				Soft	DK GRAY,	" " " (Moist)		18SFB02-0405	7			
	6				"		" "		Moist	7			
	7				"	"	" "		"	5			
	8		4		"	"	" "		Saturated	5			
	9				"	"	" "		"	6			
	10				Med Stiff	Black	" " Med Stiff		Moist	5			
	11				"	"	" " Med Stiff		"	5			
X	12		4		"	"	" " Med Stiff		18GFB02-12	5			
	13				—	DK. GRAY	~~Coarse Sand~~		Saturated	—			
	14				—	—	Silty Sand		"	—			
	15				—	—	"		"	—			
	16		Ø		—	—	"		"	—			
	17				—	DK. GRAY	~~Coarse Sand~~		Saturated	—			
	18				—	—	Silty Sand		"	—			
	19				—	—	"		"	—			
	20		Ø		—	—	"		"	—			
	21				—	DK. GRAY	~~Coarse Sand~~		Saturated	—			
	22				—	—	Silty Sand		"	—			
	23				—	—	"		"	—			
	24		Ø		—	—	"		"	—			
	25				—	—	"		"	—			

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Remarks:

Drilling Area Background (ppm): 2

Converted to Well: Yes ____ No X

Well I.D. #:

BORING LOG

PROJECT NAME: CNC- ZONE G
PROJECT NUMBER:
DRILLING COMPANY: TIDEWATER
DRILLING RIG: F250 w/ 5400
BORING NUMBER: CNCG - B02
DATE: 4-29-95
GEOLOGIST: SIBCO
DRILLER: M. COLEMAN

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
	26		—			Dk. Gray	Silty sand		Saturated	—			
	27		—			"	"		"	—			
	28		Ø			"	"		"	—			
	29												
	30												

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Remarks:

Drilling Area Background (ppm):

Converted to Well: Yes ____ No ____ Well I.D. #: ____

BORING LOG

PROJECT NAME:
PROJECT NUMBER:
DRILLING COMPANY:
DRILLING RIG: SKID LOADER

BORING NUMBER: CNC18BØ3
DATE: 4-29
GEOLOGIST: SBS(?)
DRILLER: MILLER / COLMAN

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm) Sample	Sampler BZ	Borehole**	Driller BZ**
	0												
	1					Lt. BR.	Sandy, silt		DRY	8			
	2						"		MOIST	8			
	3		2				"		"	8			
X	4						"		"	8			
	5						SOME CLAY		"	8			
	6		2			DK. GRAY	SILTY, ORG. CLAY		WET	50+			
	7			▼			"		WET	120+			
	8					BLACK	"		SATURATED	120+			
	9		2				"			120+			
				EOB									

DIESEL.

* When rock coring, enter rock brokeness.
** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Remarks:

Drilling Area Background (ppm): 8

Converted to Well: Yes ____ No X Well I.D. #:

BORING LOG

PROJECT NAME:

PROJECT NUMBER:

DRILLING COMPANY:

DRILLING RIG: SKID LOADER

BORING NUMBER: CVC 18 - B04

DATE: 4-29

GEOLOGIST: SISCO

DRILLER: COLEMAN

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS*	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
	0												
	1					Lt. Br.	Sandy Silt.		MOIST	8			
	2						"		"	8			
	3		3				"		"	8			
	4						"		MOIST	[illegible]			
	5			▼			GRAVEL			[illegible]			
	6		1			BLACK	"			15			
	7						"			[illegible]			
	8						"		DIESEL				
	9		0			BLK	SOME GRAVEL		APPEARANCE				
	10						"		(ODOR)				
	11						"						
	12		0			BLK.	"						
				EOB									

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Remarks:

Drilling Area Background (ppm):

Converted to Well: Yes ____ No ____ Well I.D. #:

BORING LOG

PROJECT NAME:
PROJECT NUMBER:
DRILLING COMPANY:
DRILLING RIG: SKID LOADER

BORING NUMBER: CNC18-BØ5
DATE: 4-29
GEOLOGIST: SISCO
DRILLER: COLEMAN

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS*	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
	0												
	1					Lt Br.	Silty sand		~~DRY~~	~~10~~			
	2								~~DRY~~				
	3		1				some clay		MOIST	10			
	4												
	5												
	6		10										
	7												
	8												
	9		1	▼		Bl.	Silty org. clay		WET	15			
	10								SAT.				
	11								SAT.	50+			
	12		3			BL.	SILTY ORG. CLAY		SATURATED				
				EOB									

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Remarks:

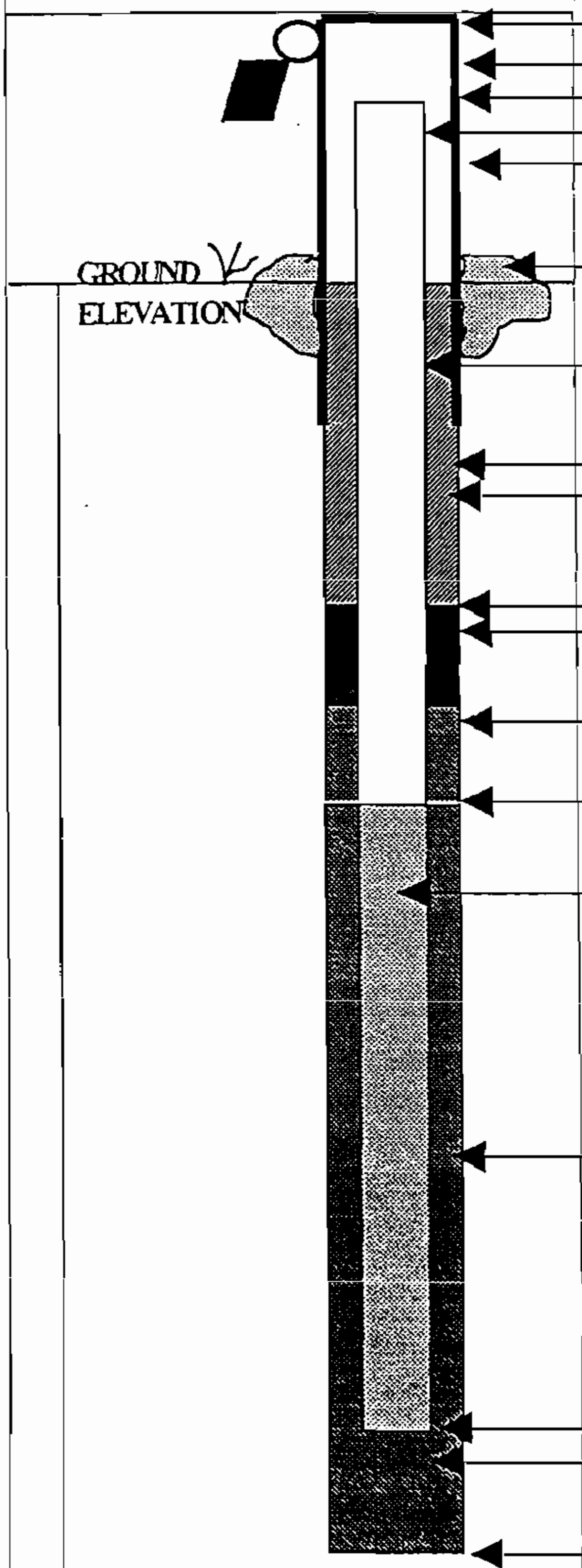
Drilling Area Background (ppm): 10

Converted to Well: Yes ____ No ____ Well I.D. #:

BORING NO.: ______

OVERBURDEN MONITORING WELL SHEET

PROJECT: CWC	LOCATION: Site 18	DRILLER
PROJECT NO.	BORING: MW01	METHOD: DPT
ELEVATION	DATE: 7/25/99	DRILLING
FIELD GEOLOGIST: P. Brand		DEVELOPMENT: NA



ELEVATION OF TOP OF SURFACE CASING: ______

ELEVATION OF TOP OF RISER PIPE: ______

STICK-UP TOP OF SURFACE CASING: ______

STICK-UP RISER PIPE: ______

I.D. OF SURFACE CASING: ______

TYPE OF SURFACE CASING: ______

TYPE OF SURFACE SEAL: Concrete - Flush mnt

RISER PIPE I.D.: ______

TYPE OF RISER PIPE: PVC - Schedule 40

BOREHOLE DIAMETER: ______

TYPE OF SEAL: ______

ELEVATION / DEPTH OF SEAL: 3.5

TYPE OS SEAL: Fine Sand

DEPTH TOP OF SAND PACK: 4'

ELEVATION / DEPTH TOP OF SCREEN: /

TYPE OF SCREEN: PVC - 40

SLOT SIZE X LENGTH: 10' x 0.01"

I.D. OF SCREEN: 1.25

TYPE OF SAND PACK: Medium Sand

ELEVATION / DEPTHBOTTOM OF SCREEN: /

ELEVATION / DEPTH BOTTOM OF SAND PACK: /

TYPE OF BACKFILL BELOW OBSERVATION WELL: ______

ELEVATION / DEPTH OF HOLE: 12.0

BORING LOG

PROJECT NAME: Cue
PROJECT NUMBER:
DRILLING COMPANY: Columbia
DRILLING RIG: Stratoprobe
BORING NUMBER: MW01 - Site 1B
DATE: 7/25
GEOLOGIST:
DRILLER: A. Bond

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	MATERIAL DESCRIPTION: Color	MATERIAL DESCRIPTION: Material Classification	USCS*	Remarks	PID/FID Reading (ppm): Sample	PID/FID Reading (ppm): Sampler BZ	PID/FID Reading (ppm): Borehole**	PID/FID Reading (ppm): Driller BZ**
	1												
	2					Brn	Sand - Med		Dry				
	3												
	4		3/4										
	5												
	6												
	7						Gravel		Saturated				
	8		6/4										
	9												
	10			No	Recovery								
	11												
	12		0/4										

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Remarks:

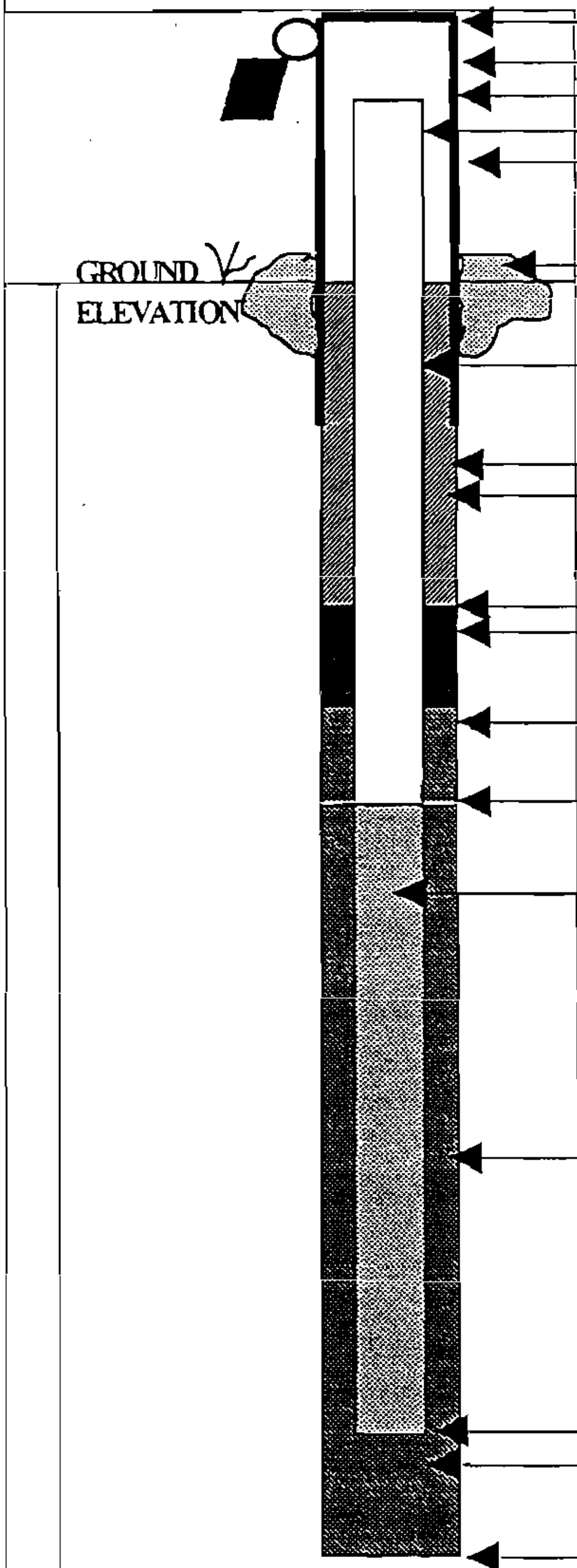
Drilling Area Background (ppm):

Converted to Well: Yes Y No ______ Well I.D. #: MW01

BORING NO.:

OVERBURDEN MONITORING WELL SHEET

PROJECT CWC	LOCATION: Site 18	DRILLER
PROJECT NO.	BORING MW02	METHOD: DPT
ELEVATION	DATE 7/25/99	DRILLING
FIELD GEOLOGIST K. Brand		DEVELOPMENT: NA



ELEVATION OF TOP OF SURFACE CASING:

ELEVATION OF TOP OF RISER PIPE:

STICK-UP TOP OF SURFACE CASING:

STICK-UP RISER PIPE:

I.D. OF SURFACE CASING:

TYPE OF SURFACE CASING:

TYPE OF SURFACE SEAL: Concrete - Flush Mut

RISER PIPE I.D.: 1.25

TYPE OF RISER PIPE: PVC 40

BOREHOLE DIAMETER:

TYPE OF SEAL:

ELEVATION / DEPTH OF SEAL: 11.5' .5"

TYPE OS SEAL: Fine Sand

DEPTH TOP OF SAND PACK: 11.0

ELEVATION / DEPTH TOP OF SCREEN: 21.0

TYPE OF SCREEN: PVC -40

SLOT SIZE X LENGTH: 0.01" x 10'

I.D. OF SCREEN: 1.25

TYPE OF SAND PACK: Medium Sand

ELEVATION / DEPTHBOTTOM OF SCREEN: 121.0

ELEVATION / DEPTH BOTTOM OF SAND PACK: 121.0

TYPE OF BACKFILL BELOW OBSERVATION WELL:

ELEVATION / DEPTH OF HOLE: 121.0

BORING LOG

PROJECT NAME: CWC
PROJECT NUMBER:
DRILLING COMPANY: Columbia
DRILLING RIG: Strataprobe

BORING NUMBER: Site 18 MW02
DATE: 7/25/98
GEOLOGIST:
DRILLER: J. Brand

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS*	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
	1					Brn	Silty Sand		moist				
	2												
	3												
	4												
	5												
	6								Saturated				
	7												
	8												
	9												
	10												
	11												
	12												

* When rock coring, enter rock brokenness.

** Include monitor reading in 5 foot intervals @ borehole. Increase reading frequency if elevated response read.

Remarks:

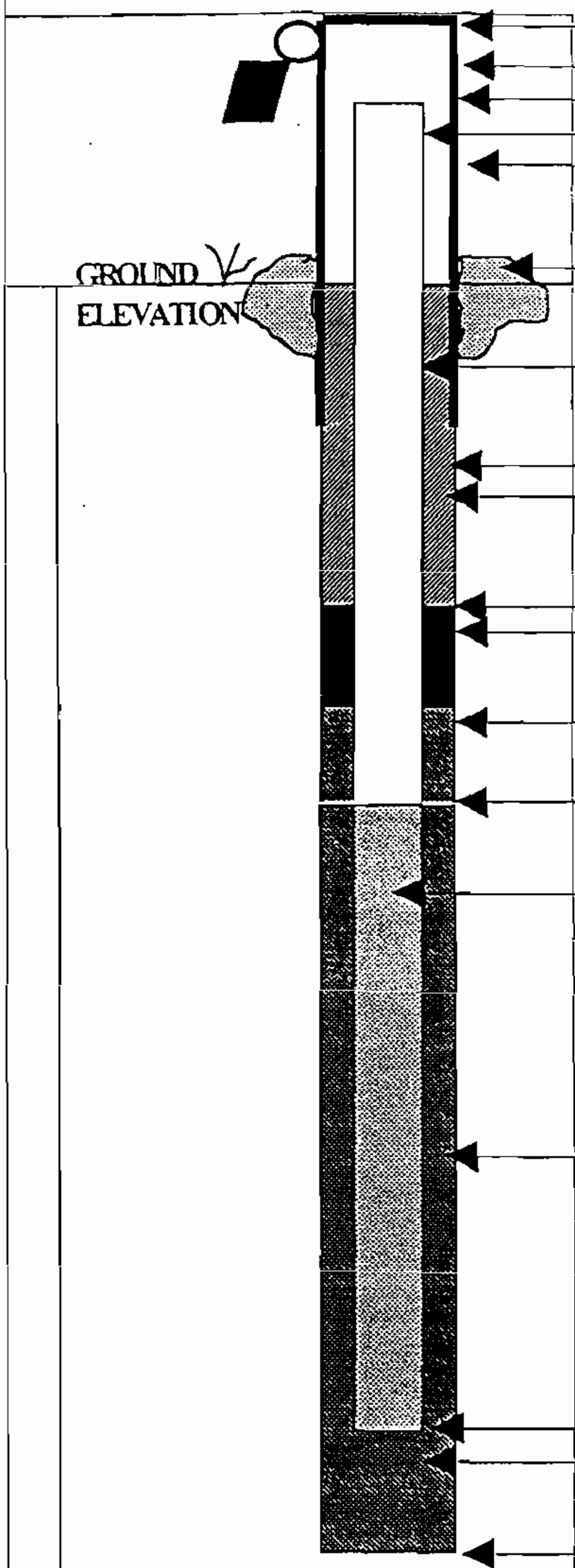
Drilling Area Background (ppm):

Converted to Well: Yes ✓ No ______ Well I.D. #: MW 02

BORING NO.: MWD-3

OVERBURDEN MONITORING WELL SHEET

PROJECT	Zone G	LOCATION:	Site 18	DRILLER	Roth
PROJECT NO.		BORING	MW-3D	METHOD: DPT	
ELEVATION		DATE	8-9-99	DRILLING	HSA
FIELD ~~GEOLOGIST~~ Tech	R. Hill			DEVELOPMENT: NA	



ELEVATION OF TOP OF SURFACE CASING:

ELEVATION OF TOP OF RISER PIPE:

STICK-UP TOP OF SURFACE CASING:

STICK-UP RISER PIPE:

I.D. OF SURFACE CASING: 8" Manhole Cover

TYPE OF SURFACE CASING:

TYPE OF SURFACE SEAL: Concrete

RISER PIPE I.D.: 2"

TYPE OF RISER PIPE: PVC. 8" outer Casing

BOREHOLE DIAMETER: 10 1/4

TYPE OF SEAL: Groute

ELEVATION / DEPTH OF SEAL: 24.0' /

TYPE OS SEAL: Bentonite

DEPTH TOP OF SAND PACK: 26.0'

ELEVATION / DEPTH TOP OF SCREEN: 28.0' /

TYPE OF SCREEN: PVC

SLOT SIZE X LENGTH: .010 X 10'

I.D. OF SCREEN: 2"

TYPE OF SAND PACK: 20/30 Silica Sand

ELEVATION / DEPTHBOTTOM OF SCREEN: 33.0 /

ELEVATION / DEPTH BOTTOM OF SAND PACK: 33.0 /

TYPE OF BACKFILL BELOW OBSERVATION WELL:

ELEVATION / DEPTH OF HOLE: /

BORING LOG

PROJECT NAME: CWC
PROJECT NUMBER:
DRILLING COMPANY: Columbia
DRILLING RIG: Strataprobe

BORING NUMBER: 18 MW03
DATE: 7/26/99
GEOLOGIST:
DRILLER: P. Bird

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS*	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
	1					Brn	Silty Sand		Moist				
	2												
	3												
	4												
	5												
	6												
	7						Sandy Clay		Saturated				
	8					Gray							
	9												
	10						Silty Sand						
	11												
	12												

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm): 0

Remarks:

Converted to Well: Yes X No ______ Well I.D. #: MW03

BORING LOG

PROJECT NAME: Site 18 Zone G
BORING NUMBER: MW03D
PROJECT NUMBER:
DATE: 8-9-99
DRILLING COMPANY: Custom Drilling
GEOLOGIST:
DRILLING RIG:
DRILLER: Rod.

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS*	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
	21						Dark greenish gray						
	22						silty Clay, Muck						
	23	2/0											
	24	0/1											
	25	1/0											
	26	1/1					same as above						
	27	Wt. Rods											
	28	1/0											
	29	0/0											
	30	0/0					Dark Gray silty clay						
	31	0/0		←			w/f. sand lens tr.						
	32	0/0					of shell frag.						
	33	0/0											
	34	0/0							Will set				
	35	0/0							well screen.				
	36	0/0							from 28'-33'				
	37	0/0											
	38	0/0		B.T.									

* When rock coring, enter rock brokeness.
** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Remarks:

Drilling Area Background (ppm):

Converted to Well: Yes ______ No ______ Well I.D. #: ______

SOUTHNAVFAC

LOG OF BORING

CNC18-MW030

Page of

PROJECT NO:	PROJECT NAME: SITE 18
PROJECT LOCATION: CNC CHARLESTON/ZONE G	DATE DRILLED: 3/8/99
DRILLING COMPANY: CUSTOM DRILLING Co	SURFACE ELEVATION: Feet
DRILLING METHOD: Hollow Stem Auger	BORING DIAMETER: Inches 10
DRILLING RIG: BK 57 MOBILE	GEOLOGIST: GERALD GOODE

DEPTH feet	SAMPLE NUMBER	BLOWS/FT.	PID (ppm) Sample	PID (ppm) B. Zone	PID (ppm) Borehole	PID (ppm) Drill B. Z.	GRAPHIC LOG Recovery	USCS/RQD	GEOLOGIC DESCRIPTION Density/Consistency, Hardness, Color	WELL DIAGRAM
	Grab								Fill Material: Surface to 3' bls 0 to 2' Sand, light brown, fine grained, intermixed with gravel pebbles and cobbles, dry	
5	Grab								2' to 3' Sand, black, some silt, intermixed with gravels and cobbles	
10	Grab								Clayey Sand, black silty, wet at 5' bls	
15	SP	1, 2, 3, 3		0ppm			60%		Silty Sandy Clay, Dark Gray, soft, plastic,	
	SP	2, 4, 3, 3		0ppm			80%		Clay, Dark Gray, sticky wood mottled, soft, plastic, wet	
20										
25										
30										
35										
40										

BORING LOG

PROJECT NAME: CNC
PROJECT NUMBER:
DRILLING COMPANY: TIDEWATER
DRILLING RIG: SKID LOADER (BM)

BORING NUMBER: ~~02~~ CNC19-B01
DATE: 4-27-99
GEOLOGIST: G. SISCO
DRILLER: PETER MILLER

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
0	0												
1	1						Sand fill						
2	2												
							CONCRETE REFUSAL @ 2'						

* When rock coring, enter rock brokeness.
** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Remarks:

Drilling Area Background (ppm): ~~0~~ 2.0

Converted to Well: Yes ____ No X Well I.D. #:

SILTY SILTY SANDS

BORING LOG

PROJECT NAME: CNC
BORING NUMBER: CNC19-BØ2
PROJECT NUMBER:
DATE: 4-27-99
DRILLING COMPANY: TIDEWATER
GEOLOGIST: G. SISCO / J. Alexander
DRILLING RIG: F250 w/ DPT Geoprobe 5400
DRILLER: MARK COLEMAN

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm) Sample	Sampler BZ	Borehole**	Driller BZ**
	0								BACKGROUND "5"				
	1				Loose	Lt. Gray	moist			5			
	2				Loose	"	Silty Sand			5			
	3				"	"	Soft			5			
	4		100%		"	Dk.				50+			
	5				"	Gray	Silt / very moist			50+			
F	6				"	"	wet		19SB02-0406	50+			
	7									50+			
	8		100%				Saturated			50+			
	9						" "			50+			
	10						" "			NA			
	11						" "			NA			
	12		25%				" "						
	13						" "						
	14						" "						
	15						" "						
	16		50%				" "						
	17						" "						
	18						" "						
	19						" "						
	20		25%				" "						
	21						" "						
	22						" "						
	23						" "						
	24		10%				" "						
	25												

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm): <5

Remarks: "F" - Field Lab Soil Sample

Converted to Well: Yes ____ No X Well I.D. #: ____

[redacted]

BORING LOG

PROJECT NAME:
PROJECT NUMBER:
DRILLING COMPANY:
DRILLING RIG:

BORING NUMBER: CNC19-BØ2
DATE: 4-27
GEOLOGIST:
DRILLER:

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
	25			dk gray									
	26						Sandy/saturated						
	27												
	28		75%				Sandy clay/mucky						
	29		EOB@28'										
	30												

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Remarks:

Drilling Area Background (ppm): 5

Well: Yes No X Well I.D. #:

BORING LOG

PROJECT NAME: CNC - ZONE G
BORING NUMBER: CNC19-BØ3
PROJECT NUMBER:
DATE: 4-27-99
DRILLING COMPANY: Tidewater
GEOLOGIST: SISCO / ALEXANDER
DRILLING RIG: F-250 w/ 5400
DRILLER: MARK COLEMAN

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
	0					gray							
	1				loose		0-1' dry w/ gravel/			5 ~~0~~			
	2		100%		firm/	gray + brown,				5 ~~0~~			
	3						3-4' sandy gray clay/			5			
	4				dark gray/		silty sand			5			
	5				darkgray/		some very dark		19SFB03-0507	50+			
	6			▼			1 6" layer of clay/dense			50+			
	7		100%		gray/		saturated			n/a			
	8												
	9												
	10												

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm): 5

Remarks:

Converted to Well: Yes ____ No ✓

Well I.D. #:

BORING LOG

PROJECT NAME: CNC-Zone G
PROJECT NUMBER:
DRILLING COMPANY: Tidewater
DRILLING RIG: F-250 w/ 5400
BORING NUMBER: CNC-19B04
DATE: 4-27
GEOLOGIST: [illegible]
DRILLER: M. Coleman

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS*	Remarks	Sample	Sampler BZ	Borehole**	Driller BZ**
	0												
	1				Med.	Br. Gray	Dry. Some gravel			5			
	2				Loose	"	Sandy clay		–	5			
	3				Loose	Lt. Gray				15			
	4		100%				Silty sand.		19SFB04-0304	50			
	5					Dk Gray	Silty, sandy			50			
	6									n/a			
	7						Saturated						
	8		100										

MATERIAL DESCRIPTION — PID/FID Reading (ppm)

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm): 5

Remarks:

Converted to Well: Yes ___ No ✓ Well I.D. #:

BORING LOG

PROJECT NAME: CNC - Zone G
BORING NUMBER: 19B05
PROJECT NUMBER:
DATE: 4-27
DRILLING COMPANY: TIDEWATER
GEOLOGIST: SISCO
DRILLING RIG: F-250 w/ 5400
DRILLER: M. COLEMAN

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
	0												
	1				Med.	Lt Brown	Dry, Gravel Fill			5			
	2				Loose	Lt. Brown	" "			5			
	3				Loose	Lt. Gray	Silty clay, some sand			5			
	4		100%			"	Silty sand			20			
	5					"	" "		19SFB05-0405	20+			
	6					Dk Gray	Some Clay			n/a			
	7			▼			Silty Sand, Saturated			↓			
	8		100%										

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm):

Remarks:

Converted to Well: Yes ____ No ✓ Well I.D. #:

BORING LOG

PROJECT NAME: CNC - ZONE G
BORING NUMBER: CNC19-BØ6
PROJECT NUMBER:
DATE: 4-28-99
DRILLING COMPANY: TIDEWATER
GEOLOGIST: ALEXANDER
DRILLING RIG: F-250 w/ 5400
DRILLER: M. COLEMAN

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
	Ø					brn	dry some gravel						
	1				loose		+ asphalt pieces			≈3			
	2						silt			≈3			
	3		3'		medium	gray	clay			≈3			
	4						3-4' moist silt			≈20			
X	5						4-7 silty clay		19SFBØ6-0506	≈20			
	6				med.		wet, dark gray			n/a			
X	7				dense		sand @ 8' / wet		19GFBØ6-08				
	8			EOB			Saturated						
	9												
	10												
	11												
	12												
	13												
	14												
	15												

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Remarks:

Drilling Area Background (ppm): 3

Converted to Well: Yes ____ No ____ Well I.D. #:

BORING LOG

PROJECT NAME: CNC - ZONE G
BORING NUMBER: CNC19-B07
PROJECT NUMBER:
DATE: 4-28-99
DRILLING COMPANY: TIDEWATER
GEOLOGIST: ALEXANDER
DRILLING RIG: E-250 w/ 5400
DRILLER: M. COLEMAN

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS*	Remarks	PID/FID Reading (ppm) Sample	Sampler BZ	Borehole**	Driller BZ**
	0						asphalt						
	1						fill (0-2)		~	3			
	2						50% fill -		~	3			
	3		4'		lt. gray		50% lt. gray		~	3			
	4						clay		~	3			
X	5								19SFB07-0506	~3			
	6				dk gray		clay / wet / medium soft			~3			
	7		4'				6-8 saturated			n/a			
	8				gray coarse sand								
	9			EOB									
	10												
	11												
	12												

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Remarks:

Drilling Area Background (ppm): 3

Converted to Well: Yes ____ No X Well I.D. #:

BORING LOG

PROJECT NAME: CNC - ZONE G
PROJECT NUMBER:
DRILLING COMPANY: TIDEWATER
DRILLING RIG: SKID LOADER [illegible]
BORING NUMBER: CNC19 - B[illegible] 8
DATE: 4-29-99
GEOLOGIST: SISCO
DRILLER: ~~[illegible]~~ D. MILLER

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS*	Remarks	PID/FID Reading (ppm) Sample	Sampler BZ	Borehole**	Driller BZ**
	0												
	1					Tan	SILTY SAND & GRAVEL		DRY	4			
	2								DRY	4			
	3		2			Tan	GRAVEL, CLAY		DRY	4			
	4					"	SILTY ORG. CLAY		MOIST	5			
	5					"	" DIESEL ODOR		"	30+			
	6		1.5	▼		"	" "		"	30+			
	7						" "		SAT.	100+			
	8						" "		"	100+			
	9		3.0				" "		"	100+			
				EOB									

* When rock coring, enter rock brokeness.
** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm): 4

Remarks:

Converted to Well: Yes ____ No X Well I.D. #:

BORING LOG

PROJECT NAME:
PROJECT NUMBER:
DRILLING COMPANY:
DRILLING RIG: SKID LOADER

BORING NUMBER: CNC 19 - B~~10~~ 9
DATE: 4-29-99
GEOLOGIST: 3150
DRILLER: D. MILLER

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	U S C S *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
	0												
	1						SILTY SAND, GRAVEL		DRY	7			
	2								DRY	7			
	3		2				SILTY, ORG CLAY		MOIST	10			
	4						" "		MOIST	10			
	5						DIESEL ODOR		WET	50+			
	6		2	▼			" "		WET	50+			
	7						" "		SATURATED	50+			
	8						W/ SAND "			50+			
	9		3				" "			50+			
				EOB									

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Remarks:

Drilling Area Background (ppm): 7

Converted to Well: Yes ______ No X Well I.D. #:

BORING LOG

PROJECT NAME:
PROJECT NUMBER:
DRILLING COMPANY:
DRILLING RIG: SKID LOADER

BORING NUMBER: CNC19 - B10
DATE: 4-29-99
GEOLOGIST: SISCO
DRILLER: PETER MILLER

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	Sample	Sampler BZ	Borehole**	Driller BZ**
	0												
	1				Soft	Lt. Br. Gray	Silty sand			7			
	2					"	"			7			
	3		3			"	" " Some gravel, tr. clay			7			
	4				Med. Stiff	Gray	Silty Org. Clay			10			
	5					"	" " "			15+			
	6		2			"	" " "			15+			
	7					"	" "			7			
	8					"	Gravel		Wet	7			
	9		2			"	Silty Org. Clay		Saturated	15+			
	10					"							
	11					"							
	12		2	EOB.		"			Sat.				

Diesel Odor

* When rock coring, enter rock brokeness.
** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm): 7

Remarks:

Converted to Well: Yes ____ No X

Well I.D. #:

[redacted]

BORING LOG

PROJECT NAME: Site 19
PROJECT NUMBER: 0124
DRILLING COMPANY: Tidewater
DRILLING RIG: Geoprobe
BORING NUMBER: CNC19-B11
DATE: 4/30/99
GEOLOGIST: B.H.
DRILLER: Peter Miller

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm) Sample	Sampler BZ	Borehole**	Driller BZ**
				0.2' / 0.9'			Asphalt @ sfc 0-0.2						
0925			2.4/3'			tan	Sand, silty, w/		sl moist	0/0	0		
	3			3'			crushed stone 0.2'-0.9'		moist				
					med dense	tan	0.9'-3.0' Silt, clayey, dry			4/5	0		
0930 19SFB110405			2.8/3'			dk gray	Sand, silty, v.f. gr		fuel odor				
	6						clayey		wet	6	0		
						tan							
0940			2.7/3'				Sand, silty, sl clayey		saturated,	0			
	9					wt gray			w/ sheen, fuel odor				
							TD 9'						

sample 4-5'

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Remarks:

Drilling Area Background (ppm):

BORING LOG

PROJECT NAME: CNC Zone G / Site 19 BORING NUMBER: CNC19 B12
PROJECT NUMBER: 0124 DATE: 5/1/99
DRILLING COMPANY: Tidewater GEOLOGIST: BDH
DRILLING RIG: Geoprobe DRILLER: PM

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
				0.4' 1.5'	soft	med brn	Topsoil, silt, roots		Brown @ sfc	0			
			2.1'/3'		loose	tan	Sand, v. f. grnd, silty,	Fe	stains, shell frags moist	0/(4)	0		0
	3				firm to soft	dk gray	Silt, clayey		moist	0/(0)			
B120304			3.0'/3'										
				4.6'					wet	0			
	6				loose	med gray	Sand, f. grn, silty			0	0		0
							w/ shell frags		wet				
			3.0'/3'							0	0		0
	9												
							TD 9'						

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Remarks: ______

Drilling Area Background (ppm): ______

BORING LOG

PROJECT NAME: Site 19
PROJECT NUMBER: 0124
DRILLING COMPANY: Tidewater
DRILLING RIG: Geoprobe
BORING NUMBER: CNC19B13
DATE: 5/1/99
GEOLOGIST: BDH
DRILLER: PM

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS*	Remarks	PID/FID Reading (ppm) Sample	Sampler BZ	Borehole**	Driller BZ**
				0.2		blk	asphalt		Asphalt [illegible]	0(0)			0
			1.5'/3'			tan	Silt, sandy		sl. moist				
	3									0			
19SFB13		0405	2.4'/3'	4.4'	loose	tan	Sand to silt, orange mottled		v. moist	0 (1500)			0
					loose	gray	Sand, clayey		wet	35			
	6						petroleum sheen/odor		strong fuel odor	300/(2600)			
					firm	red	Silt, clayey		+ staining w/ petroleum				
			3.0'/3'			gray							
	9												
							TD 9'						

-1 @ 1440
-2 @ 1442
-3 @ 1450

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area Background (ppm):

Remarks:

Converted to Well: Yes ______ No ______ Well I.D. #:

BORING LOG

F 'ECT NAME: CNC Zone G
PROJECT NUMBER: 0124
DRILLING COMPANY: Tidewater
DRILLING RIG: Geoprobe

BORING NUMBER: CNC19B14
DATE: 5/2/99
GEOLOGIST: BDH
DRILLER: PM

	Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS*	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
					0.5		mott brn	Silt, sandy, rootlets		Grass sfc	0			
1					1.1'	red-ylw		Cinders / slag		fill				
				2.6'/3'	1.8		tan	Sand, silty, mottled		moist	0/0			0
15		3				firm to mod	gray	Sand, silty, clayey, shell frags		19FB140203 moist	11			
										sl. fuel odor	10			0
2				1.9'/3'	4.4	loose	lt gray	Sand; fine grnd		wet, slight	70			
40		6								fuel odor				
										wet, fuel odor	120			
				3.0'/3'				@ 8' have 2" clayey zone sl moist			130			0
		9						TO 9'			60			

* When rock coring, enter rock brokeness.
** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Remarks: ____________________

Drilling Area Background (ppm): ______

Converted to Well: Yes ______ No ______ Well I.D. #: ____________

BORING LOG

PROJECT NAME: CNE Zone G
PROJECT NUMBER: 0124
DRILLING COMPANY: Tidewater
DRILLING RIG: Geoprobe

BORING NUMBER: CNC19B15
DATE: 5/2/99
GEOLOGIST: BDH
DRILLER: PM

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS*	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
				0.4' / 0.9'		red brown	Topsoil, silt, sdy moist rootlets		Grass @ sfc	0/0			
			2.7/3	2.1'		olive tan	clayey / Sand, clayey, mottled orange		sl. moist	0			0
	3				firm	red gry	Silt, clayey		sl moist 19FB150203	2			
			1.7/2	3.5		lt gry	Sand, silty, f-gr		wet				0
				4.4	loose		w/ shell frags		wet	7			
	6												
							Sand, clayey, f-gr		wet	20			
			3.0/3'				less clayey @ bottom			0			0
	9						w/ shell frags.			3			
							TD 9'						

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Remarks:

Drilling Area Background (ppm):

Converted to Well: Yes ____ No ____ Well I.D. #:

BORING LOG

PROJECT NAME: CNC Zone G
JECT NUMBER: 0124
DRILLING COMPANY:
DRILLING RIG: Hand auger
BORING NUMBER: CNC19 B16
DATE: 5/2/99
GEOLOGIST: BDH
DRILLER: JA

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS*	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
						grd brn	Sand silty, w/		moist, at	0			
							rx frags		fuel trench	0			0
SB B16 0203							fuel odor, soil stained		interface @ bld	123	≤2 ppm		(15) ← breathing zone
							sheen in soil @		wet	18	(140)		
							water table						
							TD 5'						

* When rock coring, enter rock brokeness.
** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Remarks:

Drilling Area Background (ppm):

Converted to Well: Yes ____ No ____ Well I.D. #: ____

BORING LOG

PROJECT NAME:
PROJECT NUMBER:
DRILLING COMPANY:
DRILLING RIG: 250 / 5400

BORING NUMBER: CNC19-B17
DATE: 5-4
GEOLOGIST: Sisco
DRILLER: P. Miller

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS*	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
	0												
	1									4			
	2				DkBrown		Sandy silt w/gravel		Moist	4			
	3				"		" "		Moist	4			
	4		3		"		" "		Moist	4			
X	5				Brown		Sandy silt		Moist	4			
	6				White to Lt. Grey		Weathered rock [illegible]		Dry	4			
	7			▼			Silty sand		Wet				
	8		2.5										
	9				Dk gray		Sandy silt		Saturated				
	10						" "		"				
	11						" "		"				
	12		4				Silty sand		Wet				
				EOB									

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Remarks:

Drilling Area Background (ppm): 4

Converted to Well: Yes ____ No X

Well I.D. #:

BORING LOG

PROJECT NAME: ______ BORING NUMBER: CNC19-B18
PROJECT NUMBER: ______ DATE: 5-4
DRILLING COMPANY: ______ GEOLOGIST: SISCO
DRILLING RIG: 350 / 5400 DRILLER: P. MILLER

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS*	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
	0												
	1						Gravel, Fill		Dry	1			
	2				Lt. Brown		Sandy silt		Moist	4			
X	3						" "		Moist	4			
	4		3.5	▼			" "		Wet	4			
	5				Olive Gray		" "		Saturated				
	6						" "		"				
	7						" "		"				
	8		3.5				Silty sand		"				
	9												
	10			EOB									
	11												
	12												
							EOB@9ft.						

* When rock coring, enter rock brokeness.
** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Remarks: ______

Drilling Area Background (ppm): 4

Converted to Well: Yes ______ No X Well I.D. #: ______

BORING LOG

PROJECT NAME:
PROJECT NUMBER:
DRILLING COMPANY:
DRILLING RIG: 250 / 5400

BORING NUMBER: CNC 19-B19
DATE: 5-4
GEOLOGIST: VSCO
DRILLER: D. MILLER

Sample No. and Type or RQD	Depth (Ft) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS*	Remarks	Sample	Sampler BZ	Borehole**	Driller BZ**
	0												
	1				Brown		Sandy silt		Dry	4			
	2				"		" " some gravel		Moist	4			
X	3				Olive gray		" " tr. clay		Moist	4			
	4		3.5		"	"	Sandy silt		Moist	4			
	5			▼	"		" "		Wet	4			
	6				"		" "		Saturated				
	7				"				Saturated				
	8		4		"		" " some clay		Wet				
				EOB									

* When rock coring, enter rock brokeness.
** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Remarks:

Drilling Area Background (ppm): 4

Converted to Well: Yes ____ No X Well I.D. #:

BORING LOG

PROJECT NAME:
PROJECT NUMBER:
DRILLING COMPANY:
DRILLING RIG: 250 / 5400

BORING NUMBER: CNC19-B20
DATE: 5-4
GEOLOGIST: SISCO
DRILLER: M. COLEMAN

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	Soil Density/ Consistency or Rock Hardness (MATERIAL DESCRIPTION)	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
	0												
	1						Asphalt & fill		Dry				
	2				Dk. gray		backfill		Dry				
X	3				"	"	Sandy silt		Moist	60			
	4		4				" "		Moist	120+			
	5												
	6				Dk. Gray				Wet				
	7				Olive gray		Silty sand		Saturated				
	8		2.5		"	"	Silty sand		Saturated				
	9												
				EOB									

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Remarks:

Drilling Area 3
Background (ppm):

Converted to Well: Yes ____ No X Well I.D. #:

BORING LOG

PROJECT NAME:
PROJECT NUMBER:
DRILLING COMPANY:
DRILLING RIG: 250 / 5400

BORING NUMBER: CNC19-B21
DATE: 5-4
GEOLOGIST: SISCO
DRILLER: D. MILLER

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
	0												
	1						Asphalt		Dry	/			
	2						Fill		Dry	/			
	3				Lt. Brown		Sandy Silt		Moist	10			
	4		4		Olive gray		Sandy silt		Moist	10			
	5			▼	Black		Sandy Silt		Moist	5			
	6				Olive gray		Silty sand		Saturated	/			
	7				"	"	Silty Sand		"	/			
	8		4		"	"	Sandy silt		Wet	/			
	9												
				EOB									

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Remarks:

Drilling Area Background (ppm): 2

Converted to Well: Yes ____ No X

Well I.D. #:

BORING LOG

PROJECT NAME:
PROJECT NUMBER:
DRILLING COMPANY:
DRILLING RIG: 350/5400
BORING NUMBER: CNC19-B22
DATE: 5-4
GEOLOGIST: S/SKO
DRILLER: D. MILLER

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS*	Remarks	PID/FID Reading (ppm) Sample	Sampler BZ	Borehole**	Driller BZ**
	0												
	1				Brown		Sandy silt		Moist	3			
	2				"		" "		"	3			
X	3				Brownish orange		Sandy silt tr. clay		"	6			
	4		4	▼	Olive gray		Silty sand		Wet	10			
	5				"		" "		Saturated	/			
	6				"		" "		"	/			
	7				"		" " tr. clay		"	/			
	8		3		"		" "		Saturated	/			
	9			EOB									

* When rock coring, enter rock brokeness.
** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Drilling Area 3
Remarks:
Background (ppm):

Converted to Well: Yes ____ No X Well I.D. #:

KTL 00101 5-5-09 JS/5

BORING LOG

PROJECT NAME: Site 19
PROJECT NUMBER: 0124
DRILLING COMPANY: Columbia
DRILLING RIG: Stratprobe

BORING NUMBER: CNC19B23
DATE: 5/27/99
GEOLOGIST: BDH
DRILLER: RB

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	Soil Density/ Consistency or Rock Hardness (MATERIAL DESCRIPTION)	Color	Material Classification	USCS*	Remarks	Sample (PID/FID Reading (ppm))	Sampler BZ	Borehole**	Driller BZ**
				0.4'	loose	grd br	Topsoil, silt, w/ roots		sl. moist				0
				1.0'		dk br	Silt, sandy, w/		(Fill)	0/0			
-1			2.2/4'				rock frags						
						grd br	Sand, silty, f. grd		moist	0			
940	4								195FB230304	0			
				5.2'					Wet @ ~4.5'				
			3.0/4.0	6.1'	soft	red gry	Sand, clayey to		moist to wet	0/1			
-2							sandy clay						
1430	8					lt gry	@6.1' Sand, f. grd		wet	0			
							TD 8'						

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Remarks: ______

Drilling Area Background (ppm): ______

Converted to Well: Yes ______ No ______ Well I.D. #: ______

BORING LOG

PROJECT NAME: Site 19
PROJECT NUMBER: 0124
DRILLING COMPANY: Columbia
DRILLING RIG: Stratoprobe

BORING NUMBER: CNC 19 B24
DATE: 5/27/99
GEOLOGIST: BDH
DRILLER: RB

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS*	Remarks	Sample	Sampler BZ	Borehole**	Driller BZ**
				0.4'	loose	red brn	Topsoil, silt						
				0.8'			crushed stone		dry	0			0
1			2.5'/4'	1.3'	firm to loose	yellow brn	Clay, sl silty		sl. moist (Fill)	0			
						tan	Sand, f. grained		sl. moist 19FB240204	0/0			
07	4					to gray	clayey @ base		wet @ 4'-4.5'	0			
2			2.2/4'										
1	8												
							TD 8'						

PID/FID Reading (ppm)

* When rock coring, enter rock brokeness.
** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Remarks: ______

Drilling Area Background (ppm): ______

Converted to Well: Yes ______ No ______ Well I.D. #: ______

BORING LOG

PROJECT NAME: Site 17
PROJECT NUMBER: 0124
DRILLING COMPANY: Columbia
DRILLING RIG: Strataprobe

BORING NUMBER: CNC 19 B25
DATE: 5/27/99
GEOLOGIST: BDH
DRILLER: RB

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	MATERIAL DESCRIPTION: Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	PID/FID Reading (ppm): Sample	Sampler BZ	Borehole**	Driller BZ**
				0.6'			crushed stone		dry.	0/0			0
S-1			1.5'/4'			tan	Sand, silty, sl.		sl. moist to	0			
@							clayey, rock frags		moist				
1104	4								19SFB250304	0/0			
			'						wet ~				
			1.6'/4'		firm to soft	red gray	clay, sandy		moist to wet	170/170		- w/ filter	
S-2													
@													
1109	8												
							TD 8'						

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Remarks: ______

Drilling Area Background (ppm): ______

Converted to Well: Yes ______ No ______ Well I.D. #: ______

BORING LOG

PROJECT NAME: CNC
PROJECT NUMBER:
DRILLING COMPANY: Columbia
DRILLING RIG: Strataprobe
BORING NUMBER: 19BZ6
DATE: 6/21/99
GEOLOGIST:
DRILLER: [illegible]

Sample No. and Type or RQD	Depth (Ft.) or Run No.	Blows / 6" or RQD (%)	Sample Recovery / Sample Length	Lithology Change (Depth/Ft.) or Screened Interval	Soil Density/ Consistency or Rock Hardness	Color	Material Classification	USCS *	Remarks	Sample	Sampler BZ	Borehole**	Driller BZ
	1					Dk Brn	Silty Sand - F-VF		Dry				
	2					Lt Brn	Silty Sand		Moist	4			
	3					and Gray	Fine Sand						
	4		3.1/4										
	5						No Recovery						
	6												
	7												
	8		0/4										

PID/FID Reading (ppm)

* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Remarks:

Drilling Area Background (ppm):

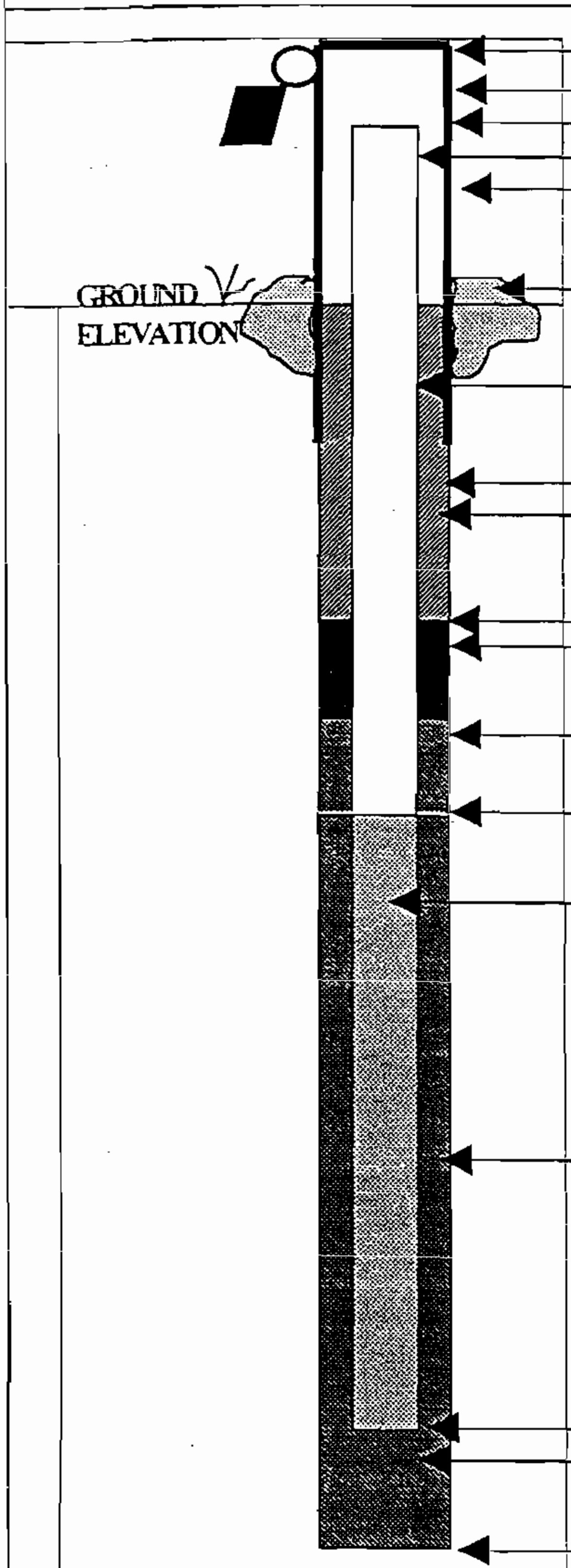
Converted to Well: Yes Temp No ______ Well I.D. #:

55

BORING NO.: CNC19-MW01

OVERBURDEN MONITORING WELL SHEET

PROJECT: CNC	LOCATION: CNC19	DRILLER: Custom Drilling
PROJECT NO.: CNC19	BORING: CNC19-MW01	METHOD: ~~DPT~~ HSA
ELEVATION:	DATE: 6/28/99	DRILLING
FIELD GEOLOGIST: Marty Ray		DEVELOPMENT: NA



ELEVATION OF TOP OF SURFACE CASING: Flush

ELEVATION OF TOP OF RISER PIPE:

STICK-UP TOP OF SURFACE CASING:

STICK-UP RISER PIPE:

I.D. OF SURFACE CASING: 8"

TYPE OF SURFACE CASING: steel man-hole with cover

TYPE OF SURFACE SEAL: concrete pad 2'x2'x6"

RISER PIPE I.D.: 2"

TYPE OF RISER PIPE: Sch 40 PVC

BOREHOLE DIAMETER: 4.25"

TYPE OF SEAL: grout to 8" bls

ELEVATION / DEPTH OF SEAL: 1'6"

TYPE OS SEAL: 30/65 choke sand

DEPTH TOP OF SAND PACK: 2'6"

ELEVATION / DEPTH TOP OF SCREEN: 3'0"

TYPE OF SCREEN: Sch 40 PVC

SLOT SIZE X LENGTH: 10 slot x 10'

I.D. OF SCREEN: 2"

TYPE OF SAND PACK: 20/30 sand

ELEVATION / DEPTHBOTTOM OF SCREEN: 13'0"

ELEVATION / DEPTH BOTTOM OF SAND PACK: 13'6"

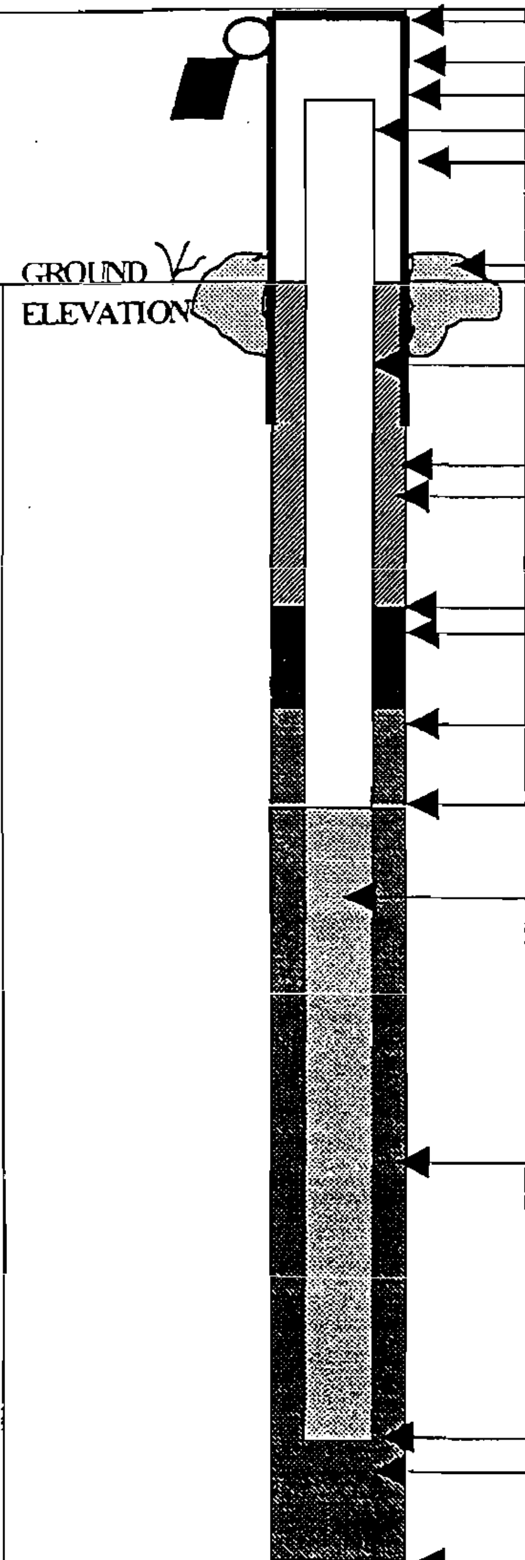
TYPE OF BACKFILL BELOW OBSERVATION WELL: 20/30 sand

ELEVATION / DEPTH OF HOLE: 13'6"

BORING NO.: CNC19-MW02

OVERBURDEN MONITORING WELL SHEET

PROJECT: CNC	LOCATION: CNC19	DRILLER: Custom Drilling	
PROJECT NO.: CNC19	BORING: CNC19-MW02	METHOD: ~~DPT~~	
ELEVATION:	DATE: 6/28/99	DRILLING: HSA	
FIELD GEOLOGIST: Marty Ray		DEVELOPMENT: NA	



ELEVATION OF TOP OF SURFACE CASING: Flush

ELEVATION OF TOP OF RISER PIPE:

STICK-UP TOP OF SURFACE CASING:

STICK-UP RISER PIPE:

I.D. OF SURFACE CASING: 8"

TYPE OF SURFACE CASING: steel man-hole cover

TYPE OF SURFACE SEAL: concrete pad 2'x2'x6"

RISER PIPE I.D.: 2"

TYPE OF RISER PIPE: Sch 40 PVC

BOREHOLE DIAMETER: 4.25"

TYPE OF SEAL: grout to 8" bls

ELEVATION / DEPTH OF SEAL: 1' 10"

TYPE OS SEAL: 30/65

DEPTH TOP OF SAND PACK: 1' 6"

ELEVATION / DEPTH TOP OF SCREEN: 2' 10

TYPE OF SCREEN: Sch 40 PVC

SLOT SIZE X LENGTH: 10 slot x 10'

I.D. OF SCREEN: 2"

TYPE OF SAND PACK: 20/30

ELEVATION / DEPTHBOTTOM OF SCREEN: 12' 0"

ELEVATION / DEPTH BOTTOM OF SAND PACK: 12' 6"

TYPE OF BACKFILL BELOW OBSERVATION WELL: 20/30

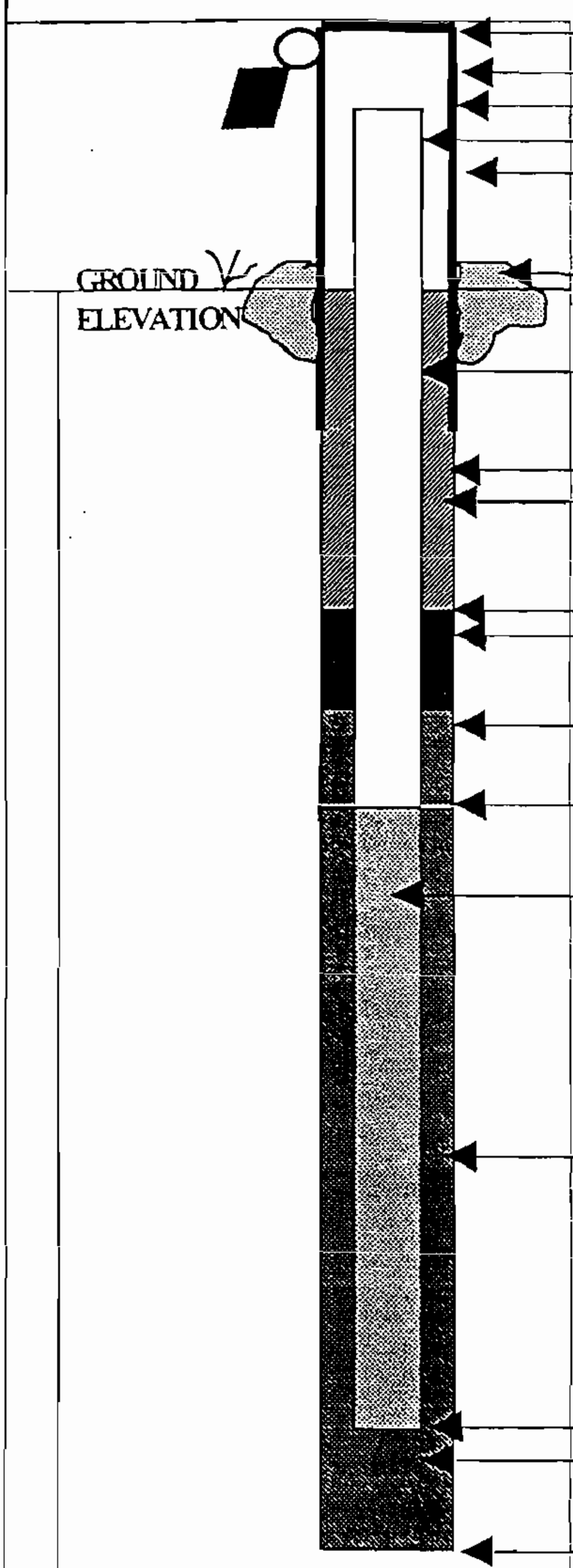
ELEVATION / DEPTH OF HOLE: 12' 6"

BORING NO.: CNC19-MW03

OVERBURDEN MONITORING WELL SHEET

PROJECT	CNC	LOCATION:	CNC19-MW03
PROJECT NO.	CNC19	BORING	CNC19-MW03
ELEVATION		DATE	6/28/99
FIELD GEOLOGIST	Marty Ray		

DRILLER: Custom Drilling
METHOD: ~~DPT~~
DRILLING: HSA
DEVELOPMENT: NA



ELEVATION OF TOP OF SURFACE CASING: Flush
ELEVATION OF TOP OF RISER PIPE:
STICK-UP TOP OF SURFACE CASING:
STICK-UP RISER PIPE:
I.D. OF SURFACE CASING: 8"
TYPE OF SURFACE CASING: steel man-hole w/cover
TYPE OF SURFACE SEAL: concrete pad 2'x2'x6"

RISER PIPE I.D.: 2" Sch 40 PVC
TYPE OF RISER PIPE: Sch 40 PVC

BOREHOLE DIAMETER: 4.25"
TYPE OF SEAL: grout to 6" bls

ELEVATION / DEPTH OF SEAL: 1'0"
TYPE OS SEAL: 30/65

DEPTH TOP OF SAND PACK: 1'6"

ELEVATION / DEPTH TOP OF SCREEN: 2'0"

TYPE OF SCREEN: Sch 40 PVC

SLOT SIZE X LENGTH: 10 slot x 10'

I.D. OF SCREEN: 2"

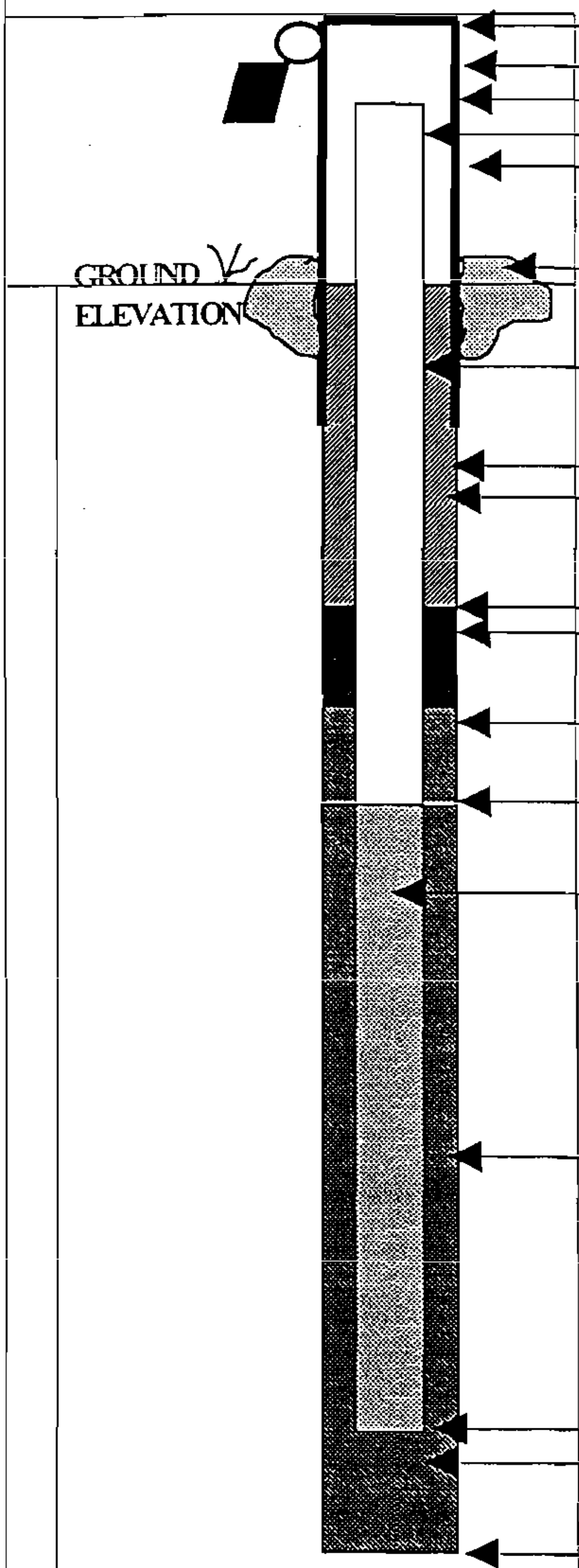
TYPE OF SAND PACK: 20/30 sand

ELEVATION / DEPTHBOTTOM OF SCREEN: 12'0"
ELEVATION / DEPTH BOTTOM OF SAND PACK: 12'6"
TYPE OF BACKFILL BELOW OBSERVATION WELL: 20/30
ELEVATION / DEPTH OF HOLE: 12'6"

BORING NO.: CNC19-MW04

OVERBURDEN MONITORING WELL SHEET

PROJECT	CNC	LOCATION:	CNC19-MW04	DRILLER	custom Drilling
PROJECT NO.	CNC19	BORING	CNC19-MW04	METHOD:	~~DPT~~
ELEVATION		DATE	6/28/99	DRILLING	HSA
FIELD GEOLOGIST	Marty Ray			DEVELOPMENT:	NA



ELEVATION OF TOP OF SURFACE CASING: Flush

ELEVATION OF TOP OF RISER PIPE:

STICK-UP TOP OF SURFACE CASING:

STICK-UP RISER PIPE:

I.D. OF SURFACE CASING: 8"

TYPE OF SURFACE CASING: steel man-hole with cover

TYPE OF SURFACE SEAL: concrete pad to 2'x2'x6"

RISER PIPE I.D.: 2"

TYPE OF RISER PIPE: sch 40 PVC

BOREHOLE DIAMETER: 4.24"

TYPE OF SEAL: grout to 6" bls

ELEVATION / DEPTH OF SEAL: 1'6"

TYPE OS SEAL: 30/65 sand

DEPTH TOP OF SAND PACK: 2'6"

ELEVATION / DEPTH TOP OF SCREEN: 3'10"

TYPE OF SCREEN: sch 40 PVC

SLOT SIZE X LENGTH: 10 slot x 10'

I.D. OF SCREEN: 2"

TYPE OF SAND PACK: 20/30 sand

ELEVATION / DEPTHBOTTOM OF SCREEN: 13'10"

ELEVATION / DEPTH BOTTOM OF SAND PACK: 13'6"

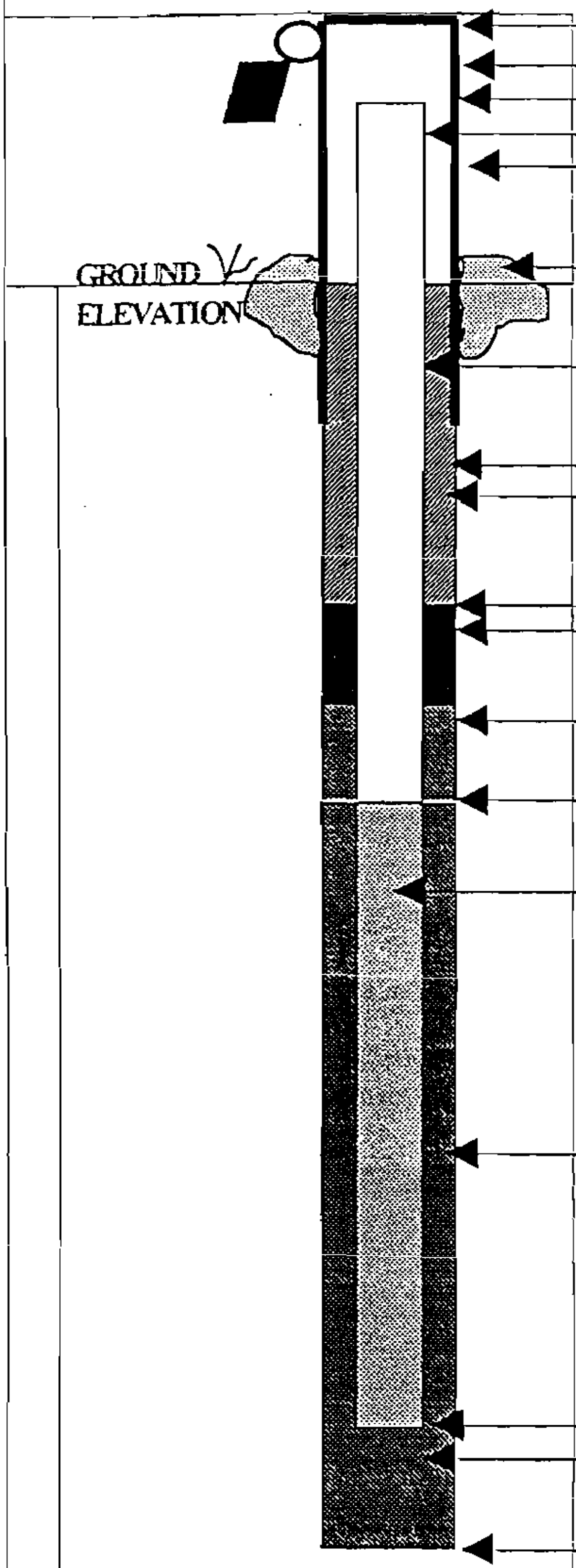
TYPE OF BACKFILL BELOW OBSERVATION WELL: 20/30 sand

ELEVATION / DEPTH OF HOLE: 13'6"

BORING NO.: CNC19-MW05

OVERBURDEN MONITORING WELL SHEET

PROJECT: CNC	LOCATION: CNC19-MW05	DRILLER: Custom Drilling
PROJECT NO.: CNC19	BORING: CNC19-MW05	METHOD: ~~BRT~~
ELEVATION:	DATE: 6/28/95	DRILLING: HSA
FIELD GEOLOGIST: Marty Ray		DEVELOPMENT: NA



ELEVATION OF TOP OF SURFACE CASING: Flush

ELEVATION OF TOP OF RISER PIPE:

STICK -UP TOP OF SURFACE CASING:

STICK-UP RISER PIPE:

I.D. OF SURFACE CASING: 8"

TYPE OF SURFACE CASING: steel man-hole with cover

TYPE OF SURFACE SEAL: concrete pad 2'x2'x6"

RISER PIPE I.D.: 2"

TYPE OF RISER PIPE: Sch 40 PVC

BOREHOLE DIAMETER: 4.25"

TYPE OF SEAL: grout to 6" bls

ELEVATION / DEPTH OF SEAL: 1'0"

TYPE OS SEAL: 30/65 sand

DEPTH TOP OF SAND PACK: 1'6"

ELEVATION / DEPTH TOP OF SCREEN: 2'0'

TYPE OF SCREEN: 2" sch 40 PVC

SLOT SIZE X LENGTH: 10 slot x 10'

I.D. OF SCREEN: 2"

TYPE OF SAND PACK: 20/30

ELEVATION / DEPTHBOTTOM OF SCREEN: 12'0"

ELEVATION / DEPTH BOTTOM OF SAND PACK: 12'6"

TYPE OF BACKFILL BELOW OBSERVATION WELL: 20/30 sand.

ELEVATION / DEPTH OF HOLE: 12'6"

APPENDIX C

FIELD SAMPLING DATA SHEETS

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: Site 18
Project No.: 0124

[] Surface Soil
[✓] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: 18SLB010203
Sample Location: CNC18B01
Sampled By: JA / BDH
C.O.C. No.:

Type of Sample:
[] Low Concentration
[] High Concentration

GRAB SAMPLE DATA:

	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 5/14/99	2'-3'	medium brown	Silt, sandy, sl. moist
Time: 0955			
Method:			
Monitor Reading (ppm): 0			

COMPOSITE SAMPLE DATA:

Date:	Time	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Method:				
Monitor Readings (Range in ppm):				

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD

Duplicate ID No.:

Signature(s):

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: Site 18
Project No.: 0124

[] Surface Soil
[✓] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: 18SLB020405
Sample Location: CNC18B02
Sampled By: JA / BDH
C.O.C. No.:

Type of Sample:
[] Low Concentration
[] High Concentration

GRAB SAMPLE DATA:

	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 5/14/99	4'-5'	medium brown	Silt, clayey, moist
Time: 0945			
Method:			
Monitor Reading (ppm): 4			

COMPOSITE SAMPLE DATA:

Date:	Time	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Method:				
Monitor Readings (Range in ppm):				

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD

Duplicate ID No.:

Signature(s):

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name:

Project No.:

Sample ID No.: 18SLB04-0405

Sample Location:

Sampled By: G. Sisto

C.O.C. No.:

[] Surface Soil
[X] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Type of Sample:
[X] Low Concentration
[] High Concentration

GRAB SAMPLE DATA:

	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 5-4-99 Time: 1600 Method: DPT. Monitor Reading (ppm):	0405	Lt. tan to Brown	Sandy silt some small gravel

COMPOSITE SAMPLE DATA:

Date:	Time	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Method:				
Monitor Readings (Range in ppm):				

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other

OBSERVATIONS / NOTES:

Headspace 15 to 20 ppm

MAP:

Circle if Applicable:

MS/MSD

Duplicate ID No.:

Signature(s): G. J. Sisto

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: Site 18
Project No.: 0124

[] Surface Soil
[✓] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: 18SLB05-0406
Sample Location: CNC18B05
Sampled By: JA / BDH
C.O.C. No.:

Type of Sample:
[] Low Concentration
[] High Concentration

GRAB SAMPLE DATA:

	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 5/14/99	4-6 ft	dark grey to black	slit with clay, moist
Time: 1120			
Method:			
Monitor Reading (ppm): 0			

COMPOSITE SAMPLE DATA:

Date:	Time	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Method:				
Monitor Readings (Range in ppm):				

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
BTEX	4 Encore	✓	
PAH	1 4oz	✓	
TPH	1 4oz	✓	
Metals	1 2oz	✓	

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:

Signature(s):

SOIL & SEDIMENT SAMPLE LOG SHEET

Collection of missed samples from May 14, 1999

Project Site Name: Site 18
Project No.: 0124

[] Surface Soil
[✓] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: 18SLB03-0506
Sample Location:
Sampled By: JA/JB
C.O.C. No.:

Type of Sample:
[] Low Concentration
[] High Concentration

GRAB SAMPLE DATA:

Date: 5/17/99	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Time: 1550	5-6'	dark brown	silty sand
Method:			
Monitor Reading (ppm): 1			

COMPOSITE SAMPLE DATA:

Date:	Time	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Method:				
Monitor Readings (Range in ppm):				

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
PAH	1 4oz jar	✓	
TOC	1 4oz jar	✓	
Grain Size, Hydrometer	1 32oz jar	✓	
BTEX	4 encore	✓	

OBSERVATIONS / NOTES:

Grain size collected at 3-4ft because there was ~~little recovery~~ a small amount of recovery at the 5-6ft level.

MAP:

Circle if Applicable:

MS/MSD

Duplicate ID No.: 18SLB03-0506D

Signature(s): Janet Bakright

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name:	Sample ID No.: 18SLB03-0405
Project No.:	Sample Location:
	Sampled By: G.S1500
[] Surface Soil	C.O.C. No.:
[X] Subsurface Soil	
[] Sediment	Type of Sample:
[] Other:	[X] Low Concentration
[] QA Sample Type:	[] High Concentration

GRAB SAMPLE DATA:

	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 5-4-99 Time: 1500 Method: SPT. Monitor Reading (ppm):	04-05	Lt. Brown	Silty sand

COMPOSITE SAMPLE DATA:

Date:	Time	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Method:				
Monitor Readings (Range in ppm):				

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other

OBSERVATIONS / NOTES:

Headspace 3ppm

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:

Signature(s):

GROUNDWATER LEVEL MEASUREMENT SHEET

Project Name: Zone G **Project No.:** 0124
Location: Site 18/19 **Personnel:** Tom/Jason, Pave, Jeff
Weather Conditions: Sunny - 90°F **Measuring Device:**
Tidally Influenced: Yes ✓ No ___ **Remarks:**

Well or Piezometer Number	Date	Time	Elevation of Reference Point (feet)*	Total Well Depth (feet)*	Water Level Indicator Readin (feet)*	Thickness of Free Produc (feet)*	Groundwater Elevation (feet)*	Comments
FDS01A	9/9	0903		12.60	6.05/9.15	3.10		
MW05	9/9	[illegible]		12.29	4.44	0		
MW01		919		13.45	5.28	0		
FDS01B		0920		9.94	4.21	0		
19MW02		0922		12.47	4.15	0		
19MW03		0924		12.30	3.37	0		
19MW04		0925		13.33	2.83	0		
FDS01C		0926		12.92	6.00	0		
FDS01D		0928		12.41	6.16	0		
18MW01		0934		11.65	4.68	0		
18MW3D		0936		36.30	3.01	0		
FDS01E		0937		10.19	4.54	0		
19MW06		0940		11.80	5.46	0		
18MW02		0942		10.45	2.77	0		

* All measurements to the nearest 0.01 foot

GROUNDWATER SAMPLE LOG SHEET

Page___ of ___

Project Site Name: CNC Site 18
Project No.: 4124

[] Domestic Well Data
[X] Monitoring Well Data
[] Other Well Type:
[] QA Sample Type:

Sample ID No.: 18GLM0101
Sample Location: ~~CNC18MW01~~ CNC18MW01
Sampled By: TNT
C.O.C. No.:
Type of Sample:
[] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 9-9-99 / Time: 1550 / Method: per.	Color Visual	pH Standard	S.C. mS/cm	Temp. Degrees C	Turbidity NTU	DO mg/l	Salinity %	Other NA

PURGE DATA:

Date: 9-9-99	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	Salinity	Other
Method: per.	Initial	6.91	.738	26.9	Ø	1.09	—	—
Monitor Reading (ppm): Ø	1	6.86	1.09	25.7	Ø	0.46	—	0.42
Well Casing Diameter & Material	2	6.87	1.29	25.7	Ø	0.60	—	0.84
Type: 1.25" PVC	3	6.89	1.42	25.6	Ø	0.94	—	1.26
Total Well Depth (TD): 11.65	4	6.92	1.49	25.7	Ø	1.77	—	1.68
Static Water Level (WL): 4.68	5	6.87	1.51	25.5	Ø	0.45	—	2.10
One Casing Volume(gal/L): 0.42								
Start Purge (hrs): 1330								
End Purge (hrs): 1343								
Total Purge Time (min): 13								
Total Vol. Purged (gal/L): 2.1								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
~~VOA~~			
PA BTEX, EDB, MTBE, Total Nap	HCL	3x40mL	3
Anions	Ø	1 x 500 mL	1
Dissolved Methane	HCL	3x40 mL	3
METALS	HNO3	1x 1 LTR	1
PAH	0	2X 1 LTR	2
			10

OBSERVATIONS / NOTES:

~~Duplicate taken~~, PDA

Circle if Applicable:

MS/MSD | Duplicate ID No.:

Signature(s):

GROUNDWATER SAMPLE LOG SHEET

Page___ of ___

Project Site Name:	CNC Site 18	Sample ID No.:	18 GLM0201
Project No.:	∅124	Sample Location:	CNC18MW02
		Sampled By:	
[] Domestic Well Data		C.O.C. No.:	
[X] Monitoring Well Data		Type of Sample:	
[] Other Well Type:		[] Low Concentration	
[] QA Sample Type:		[] High Concentration	

SAMPLING DATA:

Date: 9-9-99	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	Other
Time: 1517	Visual	Standard	mS/cm	Degrees C	NTU	mg/l	%	NA
Method: per.								

PURGE DATA:

Date: 9-9-99	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	Salinity	Other	
Method: per.	Initial	6.88	3.91	25.8	∅	0.67	—	—	—
Monitor Reading (ppm): ∅	1	6.90	3.75	25.1	∅	0.83	—	~~1.23~~	.46
Well Casing Diameter & Material	2	6.93	3.67	24.9	∅	0.72	—	~~2.46~~	.92
Type: 1.25" PVC	3	6.96	3.45	24.8	∅	1.69	—	~~3.69~~	1.38
Total Well Depth (TD): 10.45									
Static Water Level (WL): 2.77									
One Casing Volume(gal/L): ~~1.23~~	.46								
Start Purge (hrs): 1346									
End Purge (hrs): 1358									
Total Purge Time (min): 12									
Total Vol. Purged (gal/L): 1.5									

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
~~[illegible]~~	~~[illegible]~~		
BTEX, EDB, MTBE, Total Nap.	HCL	3x40ml	3
~~Anions~~	—	~~1x500 ml~~	~~1~~
~~Dissolved Methane~~	~~HCl~~	~~3x40 ml~~	~~3~~
PAH	∅	2x1 LTR	2
METALS	HNO3	1x1 LTR	1
			~~[illegible]~~ 6

OBSERVATIONS / NOTES:

18GLM0201M - MS/MSD

(18 SAMPLES)

Circle if Applicable:		(Signature(s))
MS/MSD ✓	Duplicate ID No.: 18GLM0201D	[signature]

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: CNC Site 18
Project No.: Ø124

Sample ID No.: 18GLM03D01 ~~18GLM03D01~~
Sample Location:
Sampled By:
C.O.C. No.:

[] Domestic Well Data
[X] Monitoring Well Data
[] Other Well Type:
[] QA Sample Type:

Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	Other
Date: 9-9-99	Visual	Standard	mS/cm	Degrees C	NTU	mg/l	%	NA
Time: 1601								
Method: Low Flow								

PURGE DATA:

Date: 9-9-99	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	Salinity	Other
Method: per.	Initial	7.09	23.2	26.6	Ø	0.84	—	—
Monitor Reading (ppm): Ø	1			~~26.5~~			—	5.32
Well Casing Diameter & Material	2						—	
Type: 2" PVC	3							
Total Well Depth (TD): 36.30								
Static Water Level (WL): 3.01								
One Casing Volume(gal/L): 5.32								
Start Purge (hrs): 1408								
End Purge (hrs): 1430								
Total Purge Time (min): 22								
Total Vol. Purged (gal/L):								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
8260	HCL	3 X 40 ML	3
PAH	2	2X 1 Ltr	2
METALS	HNO3	1 X 1 LTR	1
			6

OBSERVATIONS / NOTES:

1. Purged dry @ 1411 Started again @ 1415
2. Purged dry @ 1420 Started again @ 1425
3. Purged dry @ 1430 Purging completed

Circle if Applicable:

MS/MSD | Duplicate ID No.:

Signature(s):

GROUNDWATER SAMPLE LOG SHEET

Page___ of ___

Project Site Name: CNC Site 18
Project No.: Φ124

Sample ID No.: 18GL01E01
Sample Location: ~~CNC18~~ FDS01E
Sampled By:
C.O.C. No.:

[] Domestic Well Data
[X] Monitoring Well Data
[] Other Well Type:
[] QA Sample Type:

Type of Sample:
[] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 9-9-99	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	Other
Time: 1605	Visual	Standard	mS/cm	Degrees C	NTU	mg/l	%	NA
Method: per.								

PURGE DATA:

Date: 9-9-99	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	Salinity	Other
Method: per.	Initial	7.02	.678	29.1	23	1.33	—	—
Monitor Reading (ppm): Ø	1	6.97	.683	28.7	Ø	0.54	—	0.90
Well Casing Diameter & Material	2	6.93	.705	28.3	3	0.17	—	1.80
Type: 2" PVC	3	6.89	.737	27.7	Ø	0.05	—	2.70
Total Well Depth (TD): 10.19	4	6.90	.701	27.2	Ø	0.32	—	3.60
Static Water Level (WL): 4.54	5	6.89	.715	27.0	Ø	0.40		4.50
One Casing Volume(gal/L): 0.90								
Start Purge (hrs): 1402								
End Purge (hrs): 1440								
Total Purge Time (min): 38								
Total Vol. Purged (gal/L): 4.5								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
8260	HCL	3x40mL	3
PAH	Ø	2x1 LTR	2
ANIONS	Ø	1x500mL	1
DIS. METH	HCL	3x40 mL	3
METALS	HNO_3	1x1 LTR	1
			TD

OBSERVATIONS / NOTES:

Circle if Applicable:

MS/MSD | Duplicate ID No.:

Signature(s):

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: SITE 18
Project No.: 0124

[] Domestic Well Data
[X] Monitoring Well Data
[] Other Well Type:
[] QA Sample Type:

Sample ID No.: 18GL01F01
Sample Location: FDS01F
Sampled By:
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 9/9/99	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	Other
Time: 1510	Visual	Standard	mS/cm	Degrees C	NTU	mg/l	%	NA
Method:								

PURGE DATA:

Date: 9/9/99	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	Salinity	Other
Method: LOW FLOW	Initial	7.17	.772	26.3	5	1.74	Ø	
Monitor Reading (ppm): 0.0	1	6.73	.705	26.5	4	.51		
Well Casing Diameter & Material	2	6.92	.743	26.2	5	.81		
Type: 2" PVC	3	6.93	.744	26.2	4	.80		
Total Well Depth (TD): 15.35								
Static Water Level (WL): 6.43								
One Casing Volume(gal/L): 1.42								
Start Purge (hrs): 1415								
End Purge (hrs): 1445								
Total Purge Time (min): 30								
Total Vol. Purged (gal/L): 4.5								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
8260	HCL	3x40 ml	3
PAH	0	2 x 1 LTR. (AMBER)	2
METALS	HNO_3	1 x 1 LTR (PLASTIC)	1
			6

OBSERVATIONS / NOTES:

Circle if Applicable:

MS/MSD	Duplicate ID No.:	Signature(s):

Tetra Tech NUS, Inc.

FIELD ANALYTICAL LOG SHEET
GEOCHEMICAL PARAMETERS

Project Site Name: Site 18
Project No.: Ø124
Sampled By: JA/JM
Field Analyst: JA/JM
Field Form Checked as per QA/QC Checklist (initials):

Sample ID No.: 18GLM0101
Sample Location: CNC18MWØ1
Duplicate: ☐
Blank: ☐

SAMPLING DATA:

Date: 9 9 99	Color	ORP (Eh)	S.C.	Temp.	Turbidity	DO	Sal.	pH
Time:	(Visual)	(+/- mv)	(mS/cm)	(°C)	(NTU)	(Meter, mg/l)	(%)	(SU)
Method:								

SAMPLE COLLECTION/ANALYSIS INFORMATION:

Dissolved Oxygen:

Equipment: HACH Digital Titrator OX-DT CHEMetrics (Range: 0-1 mg/L) Analysis Time: 15:27

Range Used:	Range	Sample Vol.	Cartridge	Multiplier
☐	1-5 mg/L	200 ml	0.200 N	0.01
☐	2-10 mg/L	100 ml	0.200 N	0.02

Titration Count	Multiplier	Concentration
____	x 0.01	= mg/L
____	x 0.02	= mg/L

CHEMetrics: 0.2 mg/L

Notes:

Alkalinity:

Equipment: HACH Digital Titrator AL-DT CHEMetrics (Range: ____ mg/L) Analysis Time: 15:14 Filtered: ☐

Range Used:	Range	Sample Vol.	Cartridge	Multiplier	Titration Count	Multiplier	Concentration
☐	10-40 mg/L	100 ml	0.1600 N	0.1	____ & ____	x 0.1	= mg/L
☐	40-160 mg/L	25 ml	0.1600 N	0.4	____ & ____	x 0.4	= mg/L
☑	100-400 mg/L	100 ml	1.600 N	1.0	0 & 276	x 1.0	= 276 mg/L
☐	200-800 mg/L	50 ml	1.600 N	2.0	____ & ____	x 2.0	= mg/L
☐	500-2000 mg/L	20 ml	1.600 N	5.0	____ & ____	x 5.0	= mg/L
☐	1000-4000 mg/L	10 ml	1.600 N	10.0	____ & ____	x 10.0	= mg/L

Parameter:	Hydroxide	Carbonate	Bicarbonate
Relationship:	0	0	276

CHEMetrics: ____ mg/L

Notes:

Standard Additions: ☐ Titrant Molarity: ____ Digits Required: 1st.: ____ 2nd.: ____ 3rd.: ____

Carbon Dioxide:

Equipment: HACH Digital Titrator CA-DT CHEMetrics (Range: ____ mg/L) Analysis Time: 15:00

Range Used:	Range	Sample Vol.	Cartridge	Multiplier
☐	10-50 mg/L	200 ml	0.3636 N	0.1
☐	20-100 mg/L	100 ml	0.3636 N	0.2
☑	100-400 mg/L	200 ml	3.636 N	1.0
☐	200-1000 mg/L	100 ml	3.636 N	2.0

Titration Count		Concentration
____	x 0.1	= mg/L
____	x 0.2	= mg/L
232	x 1.0	= 232 mg/L
____	x 2.0	= mg/L

CHEMetrics: ____ mg/L

Notes:

Standard Additions: ☐ Titrant Molarity: ____ Digits Required: 1st.: ____ 2nd.: ____ 3rd.: ____

FIELD ANALYTICAL LOG SHEET
GEOCHEMICAL PARAMETERS

Tetra Tech NUS, Inc.

Page __ of __

Project Site Name: ______ Sample ID No.: ______

Project No.: ______ Sample Location: ______

Sampled By: ______ Duplicate: ☐

Field Analyst: ______ Blank: ☐

Field Form Checked as per QA/QC Checklist (initials): ______

SAMPLE COLLECTION/ANALYSIS INFORMATION:

Sulfide (S^{2-}):

Equipment: DR-700 DR-890 HS-C Color Chart HS-WR Color Wheel Analysis Time: ~~1365~~ 1505

Program/Module: 610nm 93 Other: ______

Concentration: 0.22 mg/L Filtered: ☐

Notes: ______

Sulfate (SO_4^{2-}):

Equipment: DR-700 DR-8__ Other: ______ Analysis Time: ______

Program/Module: 91

Concentration: ______ mg/L Filtered: ☐

Standard Solution: ☐ Results: ______

Standard Additions: ☐ Digits Required: 0.1ml:______ 0.2ml:______ 0.3ml:______

Notes: ______

Nitrite (NO_2^--N): Analysis Time: 1540

Equipment: DR-700 DR-890 Other: ______ Filtered: ☐

Program/Module: 60

Concentration: 0.002 mg/L Reagent Blank Correction: ☐

Standard Solution: ☐ Results: ☐

Notes: ______

Nitrate (NO_3^--N): Analysis Time: ______

Equipment: DR-700 DR-8__ Other: ______ Filtered: ☐

Program/Module: 55

Concentration: ______ mg/L

Nitrite Interference Treatment: ☐

Standard Solution: ☐ Results: ______ Reagent Blank Correction: ☐

Standard Additions: ☐ Digits Required: 0.1ml:______ 0.2ml:______ 0.3ml:______

Notes: ______

Tetra Tech NUS, Inc.

FIELD ANALYTICAL LOG SHEET
GEOCHEMICAL PARAMETERS

Project Site Name: ______ Sample ID No.: ______

Project No.: ______ Sample Location: ______

Sampled By: ______ Duplicate: ☐

Field Analyst: ______ Blank: ☐

Field Form Checked as per QA/QC Checklist (initials): ☐

SAMPLE COLLECTION/ANALYSIS INFORMATION:

Manganese (Mn^{2+}):

Equipment: DR-700 DR-8__ HACH MN-5 Other: ______ Analysis Time: 152ϕ

Program/Module: 525nm 41

Concentration: ϕ.5 mg/L Filtered: ☐

Digestion: ☐

Standard Solution: ☐ Results: ______ Reagent Blank Correction: ☐

Standard Additions: ☐ Digits Required: 0.1ml:______ 0.2ml:______ 0.3ml:______

Notes: ______

Ferrous Iron (Fe^{2+}):

Equipment: DR-700 DR-8 40 IR-18C Color Wheel Other: ______ Analysis Time: 1511

Program/Module: 500nm 33

Concentration: 1.9ϕ mg/L Filtered: ☐

Notes: ______

Hydrogen Sulfide (H_2S):

Equipment: HS-C Other: ______ Analysis Time: 15ϕ3

Concentration: ϕ.1 mg/L Exceeded 5.0 mg/L range on color chart: ☐

Notes: ______

QA/QC Checklist:

All data fields have been completed as necessary: ☐

Correct measurement units are cited in the SAMPLING DATA block: ☐

Mulitplication is correct for each *Multiplier* table: ☐

Final calulated concentration is within the appropriate *Range Used* block: ☐

Alkalinity *Relationship* is determined appropriatly as per manufacturer instructions: ☐

QA/QC sample (e.g., Std. Additions, etc.) frequency is appropriate as per the project planning documents: ☐

Nitrite Interference treatment used for Nitrate test if Nitrite was detected: ☐

Title block is initialized by person who performed the QA/QC Ckecklist: ☐

Tetra Tech NUS, Inc.

FIELD ANALYTICAL LOG SHEET
GEOCHEMICAL PARAMETERS

Project Site Name: Site 18
Project No.: Φ124
Sampled By: JA / JM
Field Analyst:
Field Form Checked as per QA/QC Checklist (initials):

Sample ID No.: 18GLM01E01
Sample Location:
Duplicate: ☐
Blank: ☐

SAMPLING DATA:

Date: 9 9 99	Color (Visual)	ORP (Eh) (+/- mv)	S.C. (mS/cm)	Temp. (°C)	Turbidity (NTU)	DO (Meter, mg/l)	Sal. (%)	pH (SU)
Time:								
Method:								

SAMPLE COLLECTION/ANALYSIS INFORMATION:

Dissolved Oxygen:

Equipment: HACH Digital Titrator OX-DT   CHEMetrics (Range: 0-1 mg/L)   Analysis Time: 15:30

Range Used:	Range	Sample Vol.	Cartridge	Multiplier
☐	1-5 mg/L	200 ml	0.200 N	0.01
☐	2-10 mg/L	100 ml	0.200 N	0.02

Titration Count	Multiplier	Concentration
______	x 0.01	= mg/L
______	x 0.02	= mg/L

CHEMetrics: 0.3 mg/L

Notes:

Alkalinity:

Equipment: HACH Digital Titrator AL-DT   CHEMetrics (Range: _______mg/L)   Analysis Time: 15:19   Filtered: ☐

Range Used:	Range	Sample Vol.	Cartridge	Multiplier	Titration Count	Multiplier	Concentration
☐	10-40 mg/L	100 ml	0.1600 N	0.1	______ & ______	x 0.1	= mg/L
☐	40-160 mg/L	25 ml	0.1600 N	0.4	______ & ______	x 0.4	= mg/L
☑	100-400 mg/L	100 ml	1.600 N	1.0	0 & 330	x 1.0	= 330 mg/L
☐	200-800 mg/L	50 ml	1.600 N	2.0	______ & ______	x 2.0	= mg/L
☐	500-2000 mg/L	20 ml	1.600 N	5.0	______ & ______	x 5.0	= mg/L
☐	1000-4000 mg/L	10 ml	1.600 N	10.0	______ & ______	x 10.0	= mg/L

Parameter:	Hydroxide	Carbonate	Bicarbonate
Relationship:	0	0	330

CHEMetrics: _______mg/L

Notes:

Standard Additions: ☐   Titrant Molarity:_________   Digits Required: 1st.:________ 2nd.:________ 3rd.:________

Carbon Dioxide:

Equipment: HACH Digital Titrator CA-DT   CHEMetrics (Range: _______mg/L)   Analysis Time: 15:06

Range Used:	Range	Sample Vol.	Cartridge	Multiplier
☐	10-50 mg/L	200 ml	0.3636 N	0.1
☐	20-100 mg/L	100 ml	0.3636 N	0.2
☑	100-400 mg/L	200 ml	3.636 N	1.0
☐	200-1000 mg/L	100 ml	3.636 N	2.0

Titration Count		Concentration
______	x 0.1	= mg/L
______	x 0.2	= mg/L
192	x 1.0	= 192 mg/L
______	x 2.0	= mg/L

CHEMetrics: _______mg/L

Notes:

Standard Additions: ☐   Titrant Molarity:_________   Digits Required: 1st.:________ 2nd.:________ 3rd.:________

Tetra Tech NUS, Inc.

FIELD ANALYTICAL LOG SHEET
GEOCHEMICAL PARAMETERS

Project Site Name: ______ Sample ID No.: ______

Project No.: ______ Sample Location: ______

Sampled By: ______ Duplicate: ☐

Field Analyst: ______ Blank: ☐

Field Form Checked as per QA/QC Checklist (initials): ______

SAMPLE COLLECTION/ANALYSIS INFORMATION:

Sulfide (S^{2-}):

Equipment: DR-700 DR-890 HS-C Color Chart HS-WR Color Wheel Analysis Time: 1506

Program/Module: 610nm 93 Other: ______

Concentration: 0.40 mg/L Filtered: ☐

Notes:

Sulfate (SO_4^{2-}):

Equipment: DR-700 DR-8__ Other: ______ Analysis Time: ______

Program/Module: 91

Concentration: ______ mg/L Filtered: ☐

Standard Solution: ☐ Results: ______

Standard Additions: ☐ Digits Required: 0.1ml:______ 0.2ml:______ 0.3ml:______

Notes:

Nitrite (NO_2^--N):

Analysis Time: 1542

Equipment: DR-700 DR-890 Other: ______ Filtered: ☐

Program/Module: 60

Concentration: 0.013 mg/L Reagent Blank Correction: ☐

Standard Solution: ☐ Results: ☐

Notes:

Nitrate (NO_3^--N):

Analysis Time: ______

Equipment: DR-700 DR-8__ Other: ______ Filtered: ☐

Program/Module: 55

Concentration: ______ mg/L

Nitrite Interference Treatment: ☐

Standard Solution: ☐ Results: ______ Reagent Blank Correction: ☐

Standard Additions: ☐ Digits Required: 0.1ml:______ 0.2ml:______ 0.3ml:______

Notes:

Tetra Tech NUS, Inc.

FIELD ANALYTICAL LOG SHEET
GEOCHEMICAL PARAMETERS

Page __ of __

Project Site Name: ____ Sample ID No.: ____

Project No.: ____ Sample Location: ____

Sampled By: ____ Duplicate: ☐

Field Analyst: ____ Blank: ☐

Field Form Checked as per QA/QC Checklist (initials): ☐

SAMPLE COLLECTION/ANALYSIS INFORMATION:

Manganese (Mn^{2+}):

Equipment: DR-700 DR-8__ HACH MN-5 Other: ____ Analysis Time: 1523

Program/Module: 525nm 41

Concentration: ϕ.1 mg/L Filtered: ☐

Digestion: ☐

Standard Solution: ☐ Results: ____ Reagent Blank Correction: ☐

Standard Additions: ☐ Digits Required: 0.1ml:____ 0.2ml:____ 0.3ml:____

Notes: ____

Ferrous Iron (Fe^{2+}):

Equipment: DR-700 DR-89ϕ IR-18C Color Wheel Other: ____ Analysis Time: 1512

Program/Module: 500nm 33

Concentration: ϕ.ϕ4 mg/L Filtered: ☐

Notes: ____

Hydrogen Sulfide (H_2S):

Equipment: HS-C Other: ____ Analysis Time: 15ϕ9

Concentration: ϕ.3 mg/L Exceeded 5.0 mg/L range on color chart: ☐

Notes: ____

QA/QC Checklist:

All data fields have been completed as necessary: ☐

Correct measurement units are cited in the SAMPLING DATA block: ☐

Mulitplication is correct for each *Multiplier* table: ☐

Final calulated concentration is within the appropriate *Range Used* block: ☐

Alkalinity *Relationship* is determined appropriatly as per manufacturer instructions: ☐

QA/QC sample (e.g., Std. Additions, etc.) frequency is appropriate as per the project planning documents: ☐

Nitrite Interference treatment used for Nitrate test if Nitrite was detected: ☐

Title block is initialized by person who performed the QA/QC Ckecklist: ☐

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: Site 19
Project No.: 0124

[] Surface Soil
[✓] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: 19SLB030506
Sample Location: CNC19B03
Sampled By: JA / BDH
C.O.C. No.:

Type of Sample:
[] Low Concentration
[] High Concentration

GRAB SAMPLE DATA:

	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 5/14/99	5'-6'	dark gray to medium brown	Sand, silty, moist to wet
Time: 0922			
Method:			
Monitor Reading (ppm): 3			

COMPOSITE SAMPLE DATA:

Date:	Time	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Method:				
Monitor Readings (Range in ppm):				

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:

Signature(s):

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: Site 19
Project No.: 0124

- [] Surface Soil
- [✓] Subsurface Soil
- [] Sediment
- [] Other:
- [] QA Sample Type:

Sample ID No.: 19SLB06-0506
Sample Location: CNC19B06
Sampled By: JA/BDH
C.O.C. No.:

Type of Sample:
- [] Low Concentration
- [] High Concentration

GRAB SAMPLE DATA:

	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 5/14/99	5'-6'		Sand 1.7' recovered
Time: 0907			
Method:			
Monitor Reading (ppm): 6			

COMPOSITE SAMPLE DATA:

Date:	Time	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Method:				
Monitor Readings (Range in ppm):				

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:

Signature(s):

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: Site 19
Project No.: 0124

[] Surface Soil
[✓] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: 19SLB08-0405
Sample Location: CNC19B08
Sampled By: JA/BDH
C.O.C. No.:

Type of Sample:
[] Low Concentration
[] High Concentration

GRAB SAMPLE DATA:

	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 5/14/99 Time: 0850 Method: Monitor Reading (ppm): >5000	4'-5'	dark gray	Sand; silty; sl. clayey; moist petroleum odor

COMPOSITE SAMPLE DATA:

Date:	Time	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Method:				
Monitor Readings (Range in ppm):				

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD | **Duplicate ID No.:**

Signature(s):

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: Site 19
Project No.: 0124

[] Surface Soil
[✓] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: 19SLB09-0405
Sample Location: CNC19B09
Sampled By: JA / BDH
C.O.C. No.:

Type of Sample:
[] Low Concentration
[] High Concentration

GRAB SAMPLE DATA:

	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 5/14/99 Time: 0835 Method: Monitor Reading (ppm): 700	4-5'	~~medium to~~ dark gray	Sand, clayey, moist

COMPOSITE SAMPLE DATA:

Date:	Time	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Method:				
Monitor Readings (Range in ppm):				

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
BTEX	4 Encore	✓	
PAH	1 4 oz	✓	

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD

Duplicate ID No.: 19SLB09-0405D

Signature(s):

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name:
Project No.: 0124

[] Surface Soil
[✓] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: 19SLØ9-Ø4Ø5
Sample Location:
Sampled By:
C.O.C. No.:

Type of Sample:
[] Low Concentration
[] High Concentration

GRAB SAMPLE DATA:

	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date:			
Time:	4-5'		
Method:			
Monitor Reading (ppm):			

COMPOSITE SAMPLE DATA:

Date:	Time	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Method:				
Monitor Readings (Range in ppm):				

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:

Signature(s):

SOIL & SEDIMENT SAMPLE LOG SHEET

Page 1 of 1

Project Site Name:	Sample ID No.: 19SCB10-0405
Project No.:	Sample Location:
	Sampled By: G. Sisco
[] Surface Soil	C.O.C. No.:
[X] Subsurface Soil	
[] Sediment	Type of Sample:
[] Other:	[] Low Concentration
[] QA Sample Type:	[X] High Concentration

GRAB SAMPLE DATA:

	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 5-4-99	0405		
Time: 1415			
Method: DPT			
Monitor Reading (ppm):			

COMPOSITE SAMPLE DATA:

Date:	Time	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Method:				
Monitor Readings (Range in ppm):				

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other

OBSERVATIONS / NOTES:

HEADSPACE 180 ppm

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:

Signature(s): G. F. Sisco

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: ______
Project No.: ______

Sample ID No.: 19SLB11-0405
Sample Location: ______
Sampled By: G. Sisco
C.O.C. No.: ______

[] Surface Soil
[X] Subsurface Soil
[] Sediment
[] Other: ______
[] QA Sample Type: ______

Type of Sample:
[] Low Concentration
[X] High Concentration

GRAB SAMPLE DATA:

	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 5-4-99 Time: 1330 Method: DPT Monitor Reading (ppm): 400-1000	0405	BLACK	Sandy silt

COMPOSITE SAMPLE DATA:

Date:	Time	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Method:				
Monitor Readings (Range in ppm):				

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other

OBSERVATIONS / NOTES:

Headspace 1000 ppm
air 400 ppm

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:

Signature(s): G. J. Sisco

SOIL & SEDIMENT SAMPLE LOG SHEET

Project Site Name: Site 19
Project No.: 0124

[] Surface Soil
[✓] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Sample ID No.: 19SLB16-0203
Sample Location: CNC 1916
Sampled By: JA/JB
C.O.C. No.:

Type of Sample:
[] Low Concentration
[] High Concentration

GRAB SAMPLE DATA:

	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 5/14/99	2'-3'	grey	silt, moist
Time: 1615			
Method:			
Monitor Reading (ppm): 0			

COMPOSITE SAMPLE DATA:

Date:	Time	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Method:				
Monitor Readings (Range in ppm):				

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
BTEX	4 EnCore	✓	
PAH	1 4oz jar	✓	

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:

Signature(s): Janet Eskenight

SOIL & SEDIMENT SAMPLE LOG SHEET

Collection of samples that could not be collected on May 14, 1999

Project Site Name:	Site 19	Sample ID No.:	19SLB16-0203
Project No.:	0124	Sample Location:	
		Sampled By:	JA
		C.O.C. No.:	

[] Surface Soil
[] Subsurface Soil
[] Sediment
[] Other:
[] QA Sample Type:

Type of Sample:
[] Low Concentration
[] High Concentration

GRAB SAMPLE DATA:

	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Date: 5/17/99 Time: 1640 Method: Monitor Reading (ppm): 4	2-3'	br	sandy silt

COMPOSITE SAMPLE DATA:

Date:	Time	Depth	Color	Description (Sand, Silt, Clay, Moisture, etc.)
Method:				
Monitor Readings (Range in ppm):				

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other
TOC	1 4oz jar		
Grain size, hydrometer	32oz jar		

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:

Signature(s): Janet Bonknight

GROUNDWATER LEVEL MEASUREMENT SHEET

Project Name: Zone G **Project No.:** 0124
Location: Site 18/19 **Personnel:** Tom/Jason, Paul, Jeff
Weather Conditions: Sunny - 90°F **Measuring Device:**
Tidally Influenced: Yes ✓ No ___ **Remarks:**

Well or Piezometer Number	Date	Time	Elevation of Reference Point (feet)*	Total Well Depth (feet)*	Water Level Indicator Readin (feet)*	Thickness of Free Produc (feet)*	Groundwater Elevation (feet)*	Comments
FDS01A	9/9	0903		12.60	6.05/9.15	3.10		
MW05	9/9	~~0914~~		12.29	4.44	0		
MW01		919		13.45	5.28	0		
FDS01B		0920		9.94	4.21	0		
19MW02		0922		12.47	4.15	0		
19MW03		0924		12.30	3.37	0		
19MW14		0925		13.33	2.83	0		
FDS01C		0926		12.92	6.00	0		
FDS01D		0928		12.41	6.16	0		
18MW01		0934		11.65	4.68	0		
18MW3D		0936		36.30	3.01	0		
FDS01E		0937		10.19	4.54	0		
19MW06		0940		11.80	5.46	0		
18MW02		0942		10.45	2.77	0		

* All measurements to the nearest 0.01 foot

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: Zone G/site 19
Project No.:

[] Domestic Well Data
[X] Monitoring Well Data
[] Other Well Type:
[] QA Sample Type:

Sample ID No.: 19GLMØ1Ø1
Sample Location: CNC19-MW01
Sampled By:
C.O.C. No.:
Type of Sample:
[] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 7/6/99	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	Other
Time: 11Ø7	Visual	Standard	mS/cm	Degrees C	NTU	mg/l	%	NA
Method:								

PURGE DATA:

Date:	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	Salinity	Other
Method:	Initial	6.69	1.88	29.8	62	0.89		
Monitor Reading (ppm):	1	6.73	2.23	27.4	24	0.44		
Well Casing Diameter & Material	2	6.74	2.25	27.2	34	1.21		
Type: 2" PVC	3	6.79	2.19	27.0	7	0.92		
Total Well Depth (TD): 13.40								
Static Water Level (WL): 5.42								
One Casing Volume(gal/L): 1.28								
Start Purge (hrs): 1Ø18								
End Purge (hrs): 1107								
Total Purge Time (min):								
Total Vol. Purged (gal/L): 1.28X3=	3.8 gal							

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected

OBSERVATIONS / NOTES:

H_2O col = 7.98

7.98 × .16 = 1.28

Circle if Applicable:

MS/MSD | Duplicate ID No.:

Signature(s):

19GLMØ2Ø1

GROUNDWATER SAMPLE LOG SHEET

Page___ of ___

P.C.

Project Site Name: Zone G/Site 19
Project No.:

[] Domestic Well Data
[X] Monitoring Well Data
[] Other Well Type:
[] QA Sample Type:

Sample ID No.: 19GLM~~ØØ~~2Ø1
Sample Location: CNC19-MW05
Sampled By:
C.O.C. No.:
Type of Sample:
[] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 8/6/99	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	Other
Time: 1158	Visual	Standard	mS/cm	Degrees C	NTU	mg/l	%	NA
Method:								

PURGE DATA:

Date:	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	Salinity	Other
Method:	Initial	7.05	5.02	27.0	3	0.27		
Monitor Reading (ppm):	1	6.93	4.75	25.9	2	0.14		
Well Casing Diameter & Material	2	6.89	4.53	26.3	2	0.55		
Type: 2" PVC	3	6.99	4.48	26.2	1	1.33		
Total Well Depth (TD): 12.35								
Static Water Level (WL): 4.29								
One Casing Volume(gal/L): 1.29								
Start Purge (hrs): 1017								
End Purge (hrs): 1158								
Total Purge Time (min):								
Total Vol. Purged (gal/L):								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected

OBSERVATIONS / NOTES:

H_2O Col = 8.06

8.06 × .16 = 1.29

Circle if Applicable:		Signature(s):
MS/MSD	Duplicate ID No.:	

GROUNDWATER SAMPLE LOG SHEET

Page___ of ___

Project Site Name: SITE 18
Project No.: 4124

[] Domestic Well Data
[✓] Monitoring Well Data
[] Other Well Type:
[] QA Sample Type:

Sample ID No.: CNC19MW03
Sample Location: 19GLM0301
Sampled By: DD/JP/JM/TC
C.O.C. No.:
Type of Sample:
[✓] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 9/9/99	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	Other
Time: 1059	Visual	Standard	mS/cm	Degrees C	NTU	mg/l	%	NA
Method: LOW FLOW								

PURGE DATA:

Date: 9/9/99	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	Salinity	Other
Method: LOW FLOW	Initial	7.10	3.56	26.7	3	0.73	—	
Monitor Reading (ppm): 0.0	1	6.60	3.27	26.5	4	0.40	—	
Well Casing Diameter & Material	2	6.67	3.22	26.3	4	0.40	—	
Type: 2" PVC	3	6.64	3.16	26.5	3	0.99	—	
Total Well Depth (TD): 12.30								
Static Water Level (WL): 3.37								
One Casing Volume(gal/L): 1.42								
Start Purge (hrs): 0959								
End Purge (hrs): ~~1035~~ 1038								
Total Purge Time (min): 39								
Total Vol. Purged (gal/L): 4.5								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
PAH	0	2X1 LTR	2
8260	HCL	3X40 ML	3
AMON	0	1X 500 ML	1
DS: METH	HCL	3 X 40 ML	3

OBSERVATIONS / NOTES:

Circle if Applicable:

MS/MSD | Duplicate ID No.:

Signature(s):

GROUNDWATER SAMPLE LOG SHEET

Page___ of ___

Project Site Name: CNC Zone G/Site 19
Project No.:

[] Domestic Well Data
[X] Monitoring Well Data
[] Other Well Type:
[] QA Sample Type:

Sample ID No.: 19GLM04Ø1
Sample Location: CNC19-MW04
Sampled By:
C.O.C. No.:
Type of Sample:
[] Low Concentration
[] High Concentration

SAMPLING DATA:

	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	Other
Date: 8/6/99	Visual	Standard	mS/cm	Degrees C	NTU	mg/l	%	NA
Time: 111Ø								
Method: Low Flow								

PURGE DATA:

	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	Salinity	Other
Date: 8 6 99								
Method: Peristaltic Pump	Initial	6.71	3.14	25.2	6	2.53		
Monitor Reading (ppm):	1	6.72	3.45	~~26.6~~ 25.9	20.0	0.60		
Well Casing Diameter & Material	2	6.72	3.55	25.8	13	0.95		
Type: 2" PVC	3	6.72	3.53	26.0	23	0.38		
Total Well Depth (TD): 13.41								
Static Water Level (WL): 2.36								
One Casing Volume(gal/L): 1.77								
Start Purge (hrs): 1015								
End Purge (hrs): 1110								
Total Purge Time (min):								
Total Vol. Purged (gal/L): 1.77X3=5.3								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected

OBSERVATIONS / NOTES:

H_2O Col. = 11.05'

11.05' × .16 = 1.77

All depth meas. from TOC

Circle if Applicable:

Signature(s):

MS/MSD	Duplicate ID No.:

GROUNDWATER SAMPLE LOG SHEET

Page___ of ___

Project Site Name: CNC Zone G/site 19
Project No.:

[] Domestic Well Data
[X] Monitoring Well Data
[] Other Well Type:
[] QA Sample Type:

Sample ID No.: 19GLM0501
Sample Location: CNC19MW05
Sampled By: D.R. Anderson
C.O.C. No.:
Type of Sample:
[] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 8-10-99	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	Other
Time: 1208	Visual	Standard	mS/cm	Degrees C	NTU	mg/l	%	NA
Method:								

PURGE DATA:

Date: 8-10-99	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	Salinity	Other
Method: Low Flow	Initial	6.17	3.57	26.7	6	1.93		
Monitor Reading (ppm):	1	6.36	3.84	26.8	10	0.69		
Well Casing Diameter & Material	2	6.37	4.06	26.9	0	0.65		
Type: 2" PVC	3	6.37	4.21	26.8	0	025		
Total Well Depth (TD): 12.36								
Static Water Level (WL): 3.89								
One Casing Volume(gal/L): 1.3								
Start Purge (hrs): 1131								
End Purge (hrs): 1206								
Total Purge Time (min):								
Total Vol. Purged (gal/L): 4								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
PAH	—	2 x 1 L	
BTEX / EDB	HCl	3 x 40 mL	

OBSERVATIONS / NOTES:

Greenish / Orangish algaic material suspended in H_2O.

12.36
- 3.89
8.47

2.47
x .16
4872
+ 8472
.1372 (possibly 1.3552)

Horiba Readings - Before & After Calibration

4M	4.56	84	7.33	27.6	4.23
3.96	4.47	2	8.15	"	"

Circle if Applicable:

MS/MSD	Duplicate ID No.:

Signature(s):

GROUNDWATER SAMPLE LOG SHEET

Page___ of ___

Project Site Name: SITE 18
Project No.: 0124

[] Domestic Well Data
[X] Monitoring Well Data
[] Other Well Type:
[] QA Sample Type:

Sample ID No.: 19GLM0601
Sample Location: CNC19MW06
Sampled By: PDD
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 9/9/99	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	Other
Time: 1600	Visual	Standard	mS/cm	Degrees C	NTU	mg/l	%	NA
Method: Low Flow								

PURGE DATA:

Date: 9/9/99	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	Salinity	Other
Method: LOW FLOW	Initial	6.91	.890	28.0	101	3.66		
Monitor Reading (ppm):	+	~~6.73~~	~~.707~~	~~26.5~~	~~201~~			
Well Casing Diameter & Material	1	7.27	1.13	27.9	7	5.29		
Type: 1.25" PVC	2	7.24	1.45	27.2	2	1.39		
Total Well Depth (TD): 11.80	3	7.25	1.47	27.2	2	1.40		
Static Water Level (WL): 5.46								
One Casing Volume(gal/L): .38								
Start Purge (hrs): 1425								
End Purge (hrs): 1459								
Total Purge Time (min): 34								
Total Vol. Purged (gal/L): 1.14								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
8260	HCL	3x40ml	3
PAH	Ø	2x 1 LTR AMBER	2
			5

OBSERVATIONS / NOTES:

Circle if Applicable:

MS/MSD	Duplicate ID No.:	Signature(s):

GROUNDWATER SAMPLE LOG SHEET

Project Site Name: Site 18 19
Project No.: Ø124

[] Domestic Well Data
[X] Monitoring Well Data
[] Other Well Type:
[] QA Sample Type:

Sample ID No.: 19GL01B01
Sample Location: FD501B
Sampled By: PJ.
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

Date: 9/9/99	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	Other
Time: 1040	Visual	Standard	mS/cm	Degrees C	NTU	mg/l	%	NA
Method: Peristaltic	Clear	6.85	1.04	30.6	Ø	0.76	—	

PURGE DATA:

Date: 9/9/99	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	Salinity	Other
Method: Low Flow	Initial	6.67	0.99	31.1	Ø	1.04	—	
Monitor Reading (ppm): 0.0.	1	6.80	1.05	31.4	Ø	0.74	—	
Well Casing Diameter & Material	2	6.86	1.04	30.6	Ø	0.73	—	
Type: 2" PVC	3	6.85	1.04	30.6	Ø	0.76	—	
Total Well Depth (TD): 9.94								
Static Water Level (WL): 4.21								
One Casing Volume(gal/L): .91								
Start Purge (hrs): 0956								
End Purge (hrs): 1034								
Total Purge Time (min): 38 min								
Total Vol. Purged (gal/L): 3.0 G								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
✓ 8260	HCL	3x40mL	3
DIS METH	HCL	3x40mL	3
ANION	Ø	1x 500 mL	1
PAH	Ø	2x 1 LTR	2
			9

OBSERVATIONS / NOTES:

Circle if Applicable:

MS/MSD	Duplicate ID No.:	Signature(s): [signature]

GROUNDWATER SAMPLE LOG SHEET

Page___ of ___

Project Site Name: SITE 19
Project No.: Φ124

[] Domestic Well Data
[X] Monitoring Well Data
[] Other Well Type: ___
[] QA Sample Type: ___

Sample ID No.: 19GL01C01
Sample Location: 19FSD01C
Sampled By: [illegible]
C.O.C. No.: ___
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	Other
Date: 9/9/99	Visual	Standard	mS/cm	Degrees C	NTU	mg/l	%	NA
Time: 1033								
Method: Peristaltic	Clear	6.77	1.72	25.9	8	1.13	—	

PURGE DATA:

Date: 9/9/99	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	Salinity	Other
Method: Low Flow	Initial	6.73	1.01	27.0	Φ	0.92	—	
Monitor Reading (ppm): 0.0	1	6.67	1.18	26.2	35	0.61	—	
Well Casing Diameter & Material	2	6.6Φ	1.52	25.7	17	0.29	—	
Type: 2" PVC	3	6.77	1.72	25.9	8	1.13	—	
Total Well Depth (TD): 12.92								
Static Water Level (WL): 6.00								
One Casing Volume(gal/L): 1.10								
Start Purge (hrs): 1000								
End Purge (hrs): 1033								
Total Purge Time (min): 33								
Total Vol. Purged (gal/L): 3.5								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
8062	HCL	3x40 mL	3
PAH	Φ	2x 1 LTR	2
			5

OBSERVATIONS / NOTES:

Circle if Applicable:

MS/MSD	Duplicate ID No.:	Signature(s): [signature]

GROUNDWATER SAMPLE LOG SHEET

Page___ of ___

Project Site Name: SITE TS 19
Project No.: 0124

[] Domestic Well Data
[X] Monitoring Well Data
[] Other Well Type:
[] QA Sample Type:

Sample ID No.: FDS01D
Sample Location: 19GL01D01
Sampled By: [illegible]
C.O.C. No.:
Type of Sample:
[X] Low Concentration
[] High Concentration

SAMPLING DATA:

	Color	pH	S.C.	Temp.	Turbidity	DO	Salinity	Other
Date: 9/9/99								
Time: 1043	Visual	Standard	mS/cm	Degrees C	NTU	mg/l	%	NA
Method: peristaltic	Clear	6.98	2.64	27.5	Ø	0.87	—	

PURGE DATA:

Date: 9/9/99	Volume	pH	S.C.	Temp. (C)	Turbidity	DO	Salinity	Other
Method: Low Flow	Initial	6.83	3.15	27.8	Ø	0.93	—	
Monitor Reading (ppm): 0.0	1	6.91	2.92	28.0	Ø	0.76	—	
Well Casing Diameter & Material	2	6.97	2.79	27.4	Ø	0.68	—	
Type: 2" PVC	3	6.98	2.64	27.5	Ø	0.87	—	
Total Well Depth (TD): 12.41								
Static Water Level (WL): 6.16								
One Casing Volume(gal/L): 1.0								
Start Purge (hrs): 1000								
End Purge (hrs): 1037								
Total Purge Time (min): 37								
Total Vol. Purged (gal/L): 3								

SAMPLE COLLECTION INFORMATION:

Analysis	Preservative	Container Requirements	Collected
✓ 8260	HCL	3 x 40ml	3
PAH	Ø	2 x 1 LTR	2
			5

OBSERVATIONS / NOTES:

Circle If Applicable:

MS/MSD	Duplicate ID No.:

Signature(s): [signature]

Tetra Tech NUS, Inc.

FIELD ANALYTICAL LOG SHEET
GEOCHEMICAL PARAMETERS

Page __ of __

Project Site Name: Site 19
Project No.: Ø124
Sampled By: JA/JM
Field Analyst: JA/JM
Field Form Checked as per QA/QC Checklist (initials):

Sample ID No.: 19GLMØ3Ø1
Sample Location: CNC19MWØ3
Duplicate: ☐
Blank: ☐

SAMPLING DATA:

Date: 9 9 99	Color (Visual)	ORP (Eh) (+/- mv)	S.C. (mS/cm)	Temp. (°C)	Turbidity (NTU)	DO (Meter, mg/l)	Sal. (%)	pH (SU)
Time:								
Method:								

SAMPLE COLLECTION/ANALYSIS INFORMATION:

Dissolved Oxygen:

Equipment: HACH Digital Titrator OX-DT   CHEMetrics (Range: 0-1 mg/L)   Analysis Time: 1421

Range Used:	Range	Sample Vol.	Cartridge	Multiplier
☐	1-5 mg/L	200 ml	0.200 N	0.01
☐	2-10 mg/L	100 ml	0.200 N	0.02

Titration Count	Multiplier	Concentration
	x 0.01	= mg/L
	x 0.02	= mg/L

CHEMetrics: .05 mg/L

Notes:

Alkalinity:

Analysis Time: 13:42

Equipment: HACH Digital Titrator AL-DT   CHEMetrics (Range: ____ mg/L)   Filtered: ☐

Range Used:	Range	Sample Vol.	Cartridge	Multiplier	Titration Count	Multiplier	Concentration
☐	10-40 mg/L	100 ml	0.1600 N	0.1	&	x 0.1	= mg/L
☐	40-160 mg/L	25 ml	0.1600 N	0.4	&	x 0.4	= mg/L
☐	100-400 mg/L	100 ml	1.600 N	1.0	&	x 1.0	= mg/L
☑	200-800 mg/L	50 ml	1.600 N	2.0	0 & 272	x 2.0	= 544 mg/L
☐	500-2000 mg/L	20 ml	1.600 N	5.0	&	x 5.0	= mg/L
☐	1000-4000 mg/L	10 ml	1.600 N	10.0	&	x 10.0	= mg/L

Parameter:	Hydroxide	Carbonate	Bicarbonate
Relationship:	0	0	544

CHEMetrics: ____ mg/L

Notes:

Standard Additions: ☐   Titrant Molarity: ____   Digits Required: 1st.: ____ 2nd.: ____ 3rd.: ____

Carbon Dioxide:

Equipment: HACH Digital Titrator CA-DT   CHEMetrics (Range: ____ mg/L)   Analysis Time: 14:10

Range Used:	Range	Sample Vol.	Cartridge	Multiplier
☐	10-50 mg/L	200 ml	0.3636 N	0.1
☐	20-100 mg/L	100 ml	0.3636 N	0.2
☐	100-400 mg/L	200 ml	3.636 N	1.0
☑	200-1000 mg/L	100 ml	3.636 N	2.0

Titration Count		Concentration
	x 0.1	= mg/L
	x 0.2	= mg/L
	x 1.0	= mg/L
153	x 2.0	= 306 mg/L

CHEMetrics: ____ mg/L

Notes:

Standard Additions: ☐   Titrant Molarity: ____   Digits Required: 1st.: ____ 2nd.: ____ 3rd.: ____

FIELD ANALYTICAL LOG SHEET
GEOCHEMICAL PARAMETERS

Tetra Tech NUS, Inc.

Project Site Name: ____________________ Sample ID No.: ____________________

Project No.: ____________________ Sample Location: ____________________

Sampled By: ____________________ Duplicate: ☐

Field Analyst: ____________________ Blank: ☐

Field Form Checked as per QA/QC Checklist (initials): ☐

SAMPLE COLLECTION/ANALYSIS INFORMATION:

Sulfide (S^{2-}):

Equipment: DR-700 DR-890 HS-C Color Chart HS-WR Color Wheel Analysis Time: 13147

Program/Module: 610nm 93 Other: __________

Concentration: 0.80 mg/L Filtered: ☐

Notes: Limit

Sulfate (SO_4^{2-}):

Equipment: DR-700 DR-8__ Other: __________ Analysis Time: __________

Program/Module: 91

Concentration: __________ mg/L Filtered: ☐

Standard Solution: ☐ Results: __________

Standard Additions: ☐ Digits Required: 0.1ml:______ 0.2ml:______ 0.3ml:______

Notes:

Nitrite (NO_2^--N):

Analysis Time: ~~13589A~~ 1445

Equipment: DR-700 DR-8__ Other: __________ Filtered: ☐

Program/Module: 60

Concentration: 0.000 mg/L Reagent Blank Correction: ☐

Standard Solution: ☐ Results: ☐

Notes:

Nitrate (NO_3^--N):

Analysis Time: __________

Equipment: DR-700 DR-8__ Other: __________ Filtered: ☐

Program/Module: 55

Concentration: __________ mg/L

Nitrite Interference Treatment: ☐

Standard Solution: ☐ Results: __________ Reagent Blank Correction: ☐

Standard Additions: ☐ Digits Required: 0.1ml:______ 0.2ml:______ 0.3ml:______

Notes:

Tetra Tech NUS, Inc.

FIELD ANALYTICAL LOG SHEET
GEOCHEMICAL PARAMETERS

Project Site Name: ______ Sample ID No.: ______

Project No.: ______ Sample Location: ______

Sampled By: ______ Duplicate: ☐

Field Analyst: ______ Blank: ☐

Field Form Checked as per QA/QC Checklist (initials): ☐

SAMPLE COLLECTION/ANALYSIS INFORMATION:

Manganese (Mn^{2+}):

Equipment: DR-700 DR-8 __ HACH MN-5 Other: ______ Analysis Time: 1423

Program/Module: 525nm 41

Concentration: 0.4 mg/L Filtered: ☐

Digestion: ☐

Standard Solution: ☐ Results: ______ Reagent Blank Correction: ☐

Standard Additions: ☐ Digits Required: 0.1ml: ______ 0.2ml: ______ 0.3ml: ______

Notes:

Ferrous Iron (Fe^{2+}):

Equipment: DR-700 DR-8 __ IR-18C Color Wheel Other: ______ Analysis Time: 1403

Program/Module: 500nm 33

Concentration: 2.30 mg/L Filtered: ☐

Notes:

Hydrogen Sulfide (H_2S):

Equipment: HS-C Other: ______ Analysis Time: 1358

Concentration: 0.4 mg/L Exceeded 5.0 mg/L range on color chart: ☐

Notes:

QA/QC Checklist:

All data fields have been completed as necessary: ☐

Correct measurement units are cited in the SAMPLING DATA block: ☐

Mulitplication is correct for each *Multiplier* table: ☐

Final calulated concentration is within the appropriate *Range Used* block: ☐

Alkalinity *Relationship* is determined appropriatly as per manufacturer instructions: ☐

QA/QC sample (e.g., Std. Additions, etc.) frequency is appropriate as per the project planning documents: ☐

Nitrite Interference treatment used for Nitrate test if Nitrite was detected: ☐

Title block is initialized by person who performed the QA/QC Ckecklist: ☐

etra Tech NUS, Inc.

FIELD ANALYTICAL LOG SHEET
GEOCHEMICAL PARAMETERS

Project Site Name: Site 19

Project No.: Ø124

Sampled By: JA/JM

Field Analyst: JA/JM

Field Form Checked as per QA/QC Checklist (initials):

Sample ID No.: 19GLØ1DØ1

Sample Location:

Duplicate: ☐

Blank: ☐

SAMPLING DATA:

Date: 9 9 99	Color	ORP (Eh)	S.C.	Temp.	Turbidity	DO	Sal.	pH
Time:	(Visual)	(+/- mv)	(mS/cm)	(°C)	(NTU)	(Meter, mg/l)	(%)	(SU)
Method:								

SAMPLE COLLECTION/ANALYSIS INFORMATION:

Dissolved Oxygen:

Equipment: HACH Digital Titrator OX-DT CHEMetrics (Range: 0-1 mg/L) Analysis Time: 1419

Range Used:	Range	Sample Vol.	Cartridge	Multiplier
☐	1-5 mg/L	200 ml	0.200 N	0.01
☐	2-10 mg/L	100 ml	0.200 N	0.02

Titration Count	Multiplier	Concentration
______	x 0.01	= mg/L
______	x 0.02	= mg/L

CHEMetrics: 0.4 mg/L

Notes:

Alkalinity:

Analysis Time: 13:36

Equipment: HACH Digital Titrator AL-DT CHEMetrics (Range: ______ mg/L) Filtered: ☐

Range Used:	Range	Sample Vol.	Cartridge	Multiplier	Titration Count	Multiplier	Concentration
☐	10-40 mg/L	100 ml	0.1600 N	0.1	______ & ______	x 0.1	= mg/L
☐	40-160 mg/L	25 ml	0.1600 N	0.4	______ & ______	x 0.4	= mg/L
☐	100-400 mg/L	100 ml	1.600 N	1.0	______ & ______	x 1.0	= mg/L
☑	200-800 mg/L	50 ml	1.600 N	2.0	0 & 275	x 2.0	= 550 mg/L
☐	500-2000 mg/L	20 ml	1.600 N	5.0	______ & ______	x 5.0	= mg/L
☐	1000-4000 mg/L	10 ml	1.600 N	10.0	______ & ______	x 10.0	= mg/L

Parameter:	Hydroxide	Carbonate	Bicarbonate
Relationship:	0	0	550

CHEMetrics: ______ mg/L

Notes:

Standard Additions: ☐ Titrant Molarity: ______ Digits Required: 1st.: ______ 2nd.: ______ 3rd.: ______

Carbon Dioxide:

Equipment: HACH Digital Titrator CA-DT CHEMetrics (Range: ______ mg/L) Analysis Time: 13:54

Range Used:	Range	Sample Vol.	Cartridge	Multiplier
☐	10-50 mg/L	200 ml	0.3636 N	0.1
☐	20-100 mg/L	100 ml	0.3636 N	0.2
☑	100-400 mg/L	200 ml	3.636 N	1.0
☐	200-1000 mg/L	100 ml	3.636 N	2.0

Titration Count		Concentration
______	x 0.1	= mg/L
______	x 0.2	= mg/L
322	x 1.0	= 322 mg/L
______	x 2.0	= mg/L

CHEMetrics: ______ mg/L

Notes:

Standard Additions: ☐ Titrant Molarity: ______ Digits Required: 1st.: ______ 2nd.: ______ 3rd.: ______

Tetra Tech NUS, Inc.

FIELD ANALYTICAL LOG SHEET
GEOCHEMICAL PARAMETERS

Page __ of __

Project Site Name: ____________ Sample ID No.: ____________

Project No.: ____________ Sample Location: ____________

Sampled By: ____________ Duplicate: ☐

Field Analyst: ____________ Blank: ☐

Field Form Checked as per QA/QC Checklist (initials): ____

SAMPLE COLLECTION/ANALYSIS INFORMATION:

Sulfide (S^{2-}):

Equipment: DR-700 DR-890 HS-C Color Chart HS-WR Color Wheel Analysis Time: 1348

Program/Module: 610nm 93 Other: ____

Concentration: 0.48 mg/L Filtered: ☐

Notes: ____________

Sulfate (SO_4^{2-}):

Equipment: DR-700 DR-8__ Other: ____________ Analysis Time: ____

Program/Module: 91

Concentration: ____ mg/L Filtered: ☐

Standard Solution: ☐ Results: ____

Standard Additions: ☐ Digits Required: 0.1ml:____ 0.2ml:____ 0.3ml:____

Notes: ____________

Nitrite (NO_2^--N): Analysis Time: 1444

Equipment: DR-700 DR-8__ Other: ____________ Filtered: ☐

Program/Module: 60

Concentration: 0.036 mg/L Reagent Blank Correction: ☐

Standard Solution: ☐ Results: ☐

Notes: ____________

Nitrate (NO_3^--N): Analysis Time: ____

Equipment: DR-700 DR-8__ Other: ____________ Filtered: ☐

Program/Module: 55

Concentration: ____ mg/L

Nitrite Interference Treatment: ☐

Standard Solution: ☐ Results: ____ Reagent Blank Correction: ☐

Standard Additions: ☐ Digits Required: 0.1ml:____ 0.2ml:____ 0.3ml:____

Notes: ____________

Tetra Tech NUS, Inc.

FIELD ANALYTICAL LOG SHEET
GEOCHEMICAL PARAMETERS

Project Site Name: ______ Sample ID No.: ______

Project No.: ______ Sample Location: ______

Sampled By: ______ Duplicate: ☐

Field Analyst: ______ Blank: ☐

Field Form Checked as per QA/QC Checklist (initials): ☐

SAMPLE COLLECTION/ANALYSIS INFORMATION:

Manganese (Mn^{2+}):

Equipment: DR-700 DR-8 __ HACH MN-5 Other: ______ Analysis Time: 1421

Program/Module: 525nm 41

Concentration: 0.5 mg/L Filtered: ☐

Digestion: ☐

Standard Solution: ☐ Results: ______ Reagent Blank Correction: ☐

Standard Additions: ☐ Digits Required: 0.1ml: ______ 0.2ml: ______ 0.3ml: ______

Notes: ______

Ferrous Iron (Fe^{2+}):

Equipment: DR-700 DR-8 __ IR-18C Color Wheel Other: ______ Analysis Time: 1402

Program/Module: 500nm 33

Concentration: 0.37 mg/L Filtered: ☐

Notes: ______

Hydrogen Sulfide (H_2S):

Equipment: HS-C Other: ______ Analysis Time: 1343

Concentration: 0.1 mg/L Exceeded 5.0 mg/L range on color chart: ☐

Notes: ______

QA/QC Checklist:

All data fields have been completed as necessary: ☐

Correct measurement units are cited in the SAMPLING DATA block: ☐

Mulitplication is correct for each *Multiplier* table: ☐

Final calulated concentration is within the appropriate *Range Used* block: ☐

Alkalinity *Relationship* is determined appropriatly as per manufacturer instructions: ☐

QA/QC sample (e.g., Std. Additions, etc.) frequency is appropriate as per the project planning documents: ☐

Nitrite Interference treatment used for Nitrate test if Nitrite was detected: ☐

Title block is initialized by person who performed the QA/QC Ckecklist: ☐

APPENDIX D

SOIL AND GROUNDWATER LABORATORY ANALYTICAL DATA

TIDEWATER, Inc

Zone G Master Report

Client Name: Tetra Tech NUS

Analysis: EPA Method 8021B: BTEX, Napthalene
EPA Method 8015M: TPH-DRO

Matrix: Soil

Analytical Services for Charleston Naval Complex Project

		Benzene	Toluene	Ethylbenzene	m,p-Xylene	o-Xylene	Napthalene	DRO
Quantitation Limit		**5.0 µg/kg**	**5.0 µg/kg**	**5.0 µg/kg**	**5.0 µg/kg**	**5.0 µg/kg**	**5.0 µg/kg**	**10 mg/kg**
Sample ID	**Date/Time**	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(mg/kg)
16SFB01-0304	4-30/0840	<5.0	<5.0	17	<5.0	53	510	33
16SFB01-0304*	4-30/0840	<5.0	<5.0	6.3	8.0	35	480	NA
16SFB02-0304	4-30/1000	<5.0	<5.0	<5.0	15	<5.0	19000	270
16SFB03-0304	4-30/1050	<5.0	<5.0	<5.0	<5.0	<5.0	64	44
16SFB04-0304	4-30/1130	34	20	320	410	1700	39000	360
16SFB05-0203	4-30/1215	<5.0	<5.0	<5.0	<5.0	<5.0	3800	<10
16SFB06-0304	5-01/1215	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10
16SFB07-0304	5-01/1300	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	19
16SFB08-0304	5-01/1330	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10
16SFB09-0304	5-01/1400	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10
16SFB10-0304	5-01/1430	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10
16SFB11-0304	5-02/0910	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10
16SFB14-0304	5-03/0840	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10
16SFB14-0304*	5-03/0840	NA	NA	NA	NA	NA	NA	<10
17SFB01-0708	5-02/1300	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10
17SFB02-0809	5-02/1450	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10
17SFB03-0506	5-02/1515	<5.0	<5.0	34	<5.0	16	17000	1200
17SFB04-0304	5-02/1550	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10
17SFB05-0708	5-02/1635	<5.0	<5.0	<5.0	<5.0	<5.0	330	57
17SFB06-0910	5-03/1110	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10
17SFB07-0910	5-03/1155	<5.0	<5.0	<5.0	<5.0	<5.0	140	<10
17SFB07-0910*	5-03/1155	<5.0	<5.0	<5.0	<5.0	<5.0	170	NA
17SFB08-1011	5-03/1345	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10
17SFB09-1011	5-03/1440	<5.0	<5.0	<5.0	<5.0	<5.0	1100	130
18SFB01-03	4-27/1010	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10
18SFB02-0405	4-29/0845	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10
18SFB03-0405	4-29/1430	<5.0	<5.0	<5.0	<5.0	<5.0	29	<10
18SFB04-0405	4-29/1345	<5.0	<5.0	<5.0	<5.0	9.6	13	<10
18SFB05-0809	4-29/1420	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10

18SFB05-0809*	4-29/1420	NA	NA	NA	NA	NA	NA	<10

Quantitation Limit		Benzene 5.0 µg/kg	Toluene 5.0 µg/kg	Ethylbenzene 5.0 µg/kg	m,p-Xylene 5.0 µg/kg	o-Xylene 5.0 µg/kg	Napthalene 5.0 µg/kg	DRO 10 mg/kg
Sample ID	**Date/Time**	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(µg/kg)	(mg/kg)
19SFB02-0406	4-27/0950	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10
19SFB03-0507	4-27/1430	<5.0	<5.0	<5.0	<5.0	<5.0	170	<10
19SFB04-0304	4-27/1500	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10
19SFB05-0405	4-27/1530	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10
19SFB06-0506	4-28/0900	<5.0	<5.0	<5.0	<5.0	<5.0	93	55
19SFB08-0506	4-29/1040	<5.0	<5.0	<5.0	<5.0	5.6	460	<10
19SFB08-0506*	4-29/1040	NA	NA	NA	NA	NA	NA	<10
19SFB09-0405	4-29/1100	<5.0	<5.0	<5.0	<5.0	<5.0	620	140
19SFB10-0405	4-29/1130	<5.0	<5.0	<5.0	<5.0	<5.0	460	44
19SFB11-0405	4-30/0930	<5.0	<5.0	<5.0	<5.0	<5.0	700	300
19SFB12-0304	5-01/1043	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10
19SFB13-0405	5-01/1144	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	22
19SFB14-0203	5-02/0935	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10
19SFB15-0203	5-02/1020	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	16
19SFB15-0203*	5-02/1020	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	NA
19SFB16-0203	5-02/1240	<5.0	<5.0	<5.0	<5.0	<5.0	1300	150
19SFB16-0203*	5-02/1240	NA	NA	NA	NA	NA	NA	176
19SFB17-0405	5-04/0800	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	23
19SFB17-0405*	5-04/0800	NA	NA	NA	NA	NA	NA	24
19SFB18-0304	5-04/0855	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10
19SFB18-0304*	5-04/0855	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	NA
19SFB19-0304	5-04/0940	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10
19SFB20-0304	5-04/1010	<5.0	<5.0	<5.0	<5.0	<5.0	27	<10
19SFB21-0304	5-04/1045	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10
19SFB22-0304	5-04/1115	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<10

Note: µg/L denotes parts per billion (ppb)
mg/L denotes parts per million (ppm)

* indicates laboratory duplicate
NA indicates No Analysis was performed

TIDEWATER, Inc

		Benzene	Toluene	Ethylbenzene	m,p-Xylene	o-Xylene	Napthalene	DRO
Quantitation Limit		1.0 µg/L	1.0 µg/L	1.0 µg/L	1.0 µg/L	1.0 µg/L	1.0 µg/L	0.1 mg/L
Sample ID	**Date/Time**	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(mg/L)
18GFB01-06	4-28/0900	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	0.1
18GFB02-12	4-29/0850	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<0.1
18GFB02-12*	4-29/0850	NA	NA	NA	NA	NA	NA	<0.1
18GFB03-08	5-04/1320	<1.0	<1.0	<1.0	<1.0	<1.0	23	NA
18GFB04-09	5-04/1545	<1.0	<1.0	<1.0	<1.0	<1.0	10	0.4
18GFB05-12	4-29/1430	<1.0	<1.0	<1.0	<1.0	<1.0	6.4	NA
19GFB02-08	4-27/1030	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	0.1
19GFB03-08	4-27/1430	<1.0	<1.0	<1.0	1.8	1.3	120	3.4
19GFB04-08	4-27/1515	<1.0	<1.0	<1.0	<1.0	<1.0	5.8	0.8
19GFB05-08	4-27/1535	<1.0	<1.0	<1.0	<1.0	<1.0	3.1	0.7
19GFB06-08	4-28/0910	<1.0	<1.0	1.8	<1.0	<1.0	14	0.5
19GFB07-08	4-28/1000	<1.0	<1.0	<1.0	<1.0	<1.0	35	0.4
19GFB09-09	4-29/1110	<1.0	<1.0	<1.0	1.3	<1.0	130	1.6
19GFB10-10	4-29/1140	<1.0	<1.0	<1.0	<1.0	<1.0	22	6.0
19GFB11-07	4-30/1015	1.5	<1.0	<1.0	<1.0	<1.0	450	1.4
19GFB12-07	5-01/1105	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	0.2
19GFB13-07	5-01/1158	6.5	<1.0	<1.0	1.6	1.3	1900	27
19GFB13-07*	5-01/1158	NA	NA	NA	NA	NA	NA	27
19GFB14-09	5-02/0950	<1.0	<1.0	<1.0	<1.0	<1.0	15	0.8
19GFB14-09*	5-02/0950	<1.0	<1.0	<1.0	<1.0	<1.0	7.9	NA
19GFB15-07	5-02/1030	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	0.3
19GFB16-07	5-04/1135	32	<1.0	4.2	3.7	1	1400	2.9
19GFB17-11	5-04/0825	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	0.3
19GFB18-09	5-04/0910	<1.0	<1.0	<1.0	<1.0	<1.0	6.2	0.1
19GFB19-09	5-04/0950	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<0.1
19GFB20-09	5-04/1020	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	0.1
19GFB21-09	5-04/1055	3.1	<1.0	<1.0	1.9	<1.0	1600	5.6
19GFB22-09	5-04/1130	1.5	<1.0	<1.0	<1.0	<1.0	28	1.2
19GFB22-09*	5-04/1130	3.3	<1.0	<1.0	<1.0	<1.0	44	1.1

Note: µg/L denotes parts per billion (ppb)
mg/L denotes parts per million (ppm)

* indicates laboratory duplicate
NA indicates No Analysis was performed

Katahdin
ANALYTICAL SERVICES

SDG NARRATIVE
KATAHDIN ANALYTICAL SERVICES
TETRA TECH NUS
CASE CNC CHARLESTON, SC CTO #68

Sample Receipt

The following samples were received on May 4 and 5, 1999 and were logged in under Katahdin Analytical Services work order numbers WP2300 and WP2356 for a hardcopy due date of June 4, 1999.

KATAHDIN Sample No.	TETRA TECH Sample Identification	GEL Sample No.
WP2300-1	19TL00101	
WP2300-2	19SLB11-0405	
✓ WP2300-3	18SLB03-0405	
✓ WP2300-4	18SLB04-0405	
WP2300-5	19SLB10-0405	
✓ WP2356-1	18SLB04-0405	9905110-01
✓ WP2356-2	18SLB03-0405	9905110-02
WP2356-3	19SLB11-0405	9905110-03

The samples were logged in for the analyses specified on the chain of custody form. All problems encountered and resolved during sample receipt have been documented on the applicable chain of custody forms.

Sample analyses have been performed by the methods as noted herein.

Volatile Organic Analysis

One aqueous (trip blank) and four soil/sediment samples were received by the Katahdin Analytical Services, Inc. GC/MS laboratory on May 5, 1999 and were specified to be analyzed by USEPA method 8260B for the analytes benzene, toluene, ethylbenzene, xylenes, MTBE, naphthalene, and EDB.

Analyses for this SDG were performed on instruments 5972-S (low level soil) and 5972-Z (aqueous/medium level soil). A VSTD050 (50 ppb standard) was used for the continuing calibration standard. Internal standard and surrogate compounds were also spiked at 50 ug/l.

Batch QC (VBLK, and LCS) was performed in each twelve hour window. Results are included in this data package. The LCS QC samples were spiked with the entire list of compounds

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quantitated for at 50 ppb. No matrix spike/matrix spike duplicate pair was analyzed on any of the samples in this workorder.

Method 8000B, section 7.5.1.2.1 (Revision 2, 12/96) states, "in those instances where the RSD for one or more analytes exceeds 20%, the initial calibration curve may still be acceptable if the mean of the RSD values for all analytes in the calibration is less than or equal to 20%." Method 8260B narrows this 20% maximum to 15%.

In the calibration curves analyzed in this SDG, several analytes had %RSD values exceeding the allowed 15%. Since the average %RSD for all analytes was 8.7%, 14.5%, and 12.6%, the curves were acceptable.

Initial analysis of sample WP2300-2 following low level protocols yielded a concentration of naphthalene over the upper limit of the calibration curve. Reanalysis occurred following medium level protocols. Both sets of data for this sample are included in the data package.

Initial analysis of sample WP2300-3 following low level protocols was performed thirty-five minutes outside of the twelve hour BFB tuning window. Reanalysis yielded internal standard and surrogate recovery deviations. Due to insufficient sample, a third analysis could not be performed. Both sets of data for this sample are included in this data package.

Initial analysis of sample WP2300-4 yielded surrogate recovery deviations. Reanalysis yielded internal standard area recovery deviations, confirming matrix interference. Both sets of data for this sample are included in this data package.

Sample WP2300-5 was analyzed following medium level protocols only due to the matrix and high concentrations of target analytes, resulting in elevated reporting limits.

Several manual integrations were performed due to split peaks; all have been flagged with a "M" (software-generated) on the pertinent quantitation reports. All "M" flags have been dated and initialed by the analyst performing the integration. In addition, all "M" flags have been reviewed and approved by the GC/MS supervisor. Copies of each manual integration are included in the pertinent quantitation reports.

No other protocol deviations were noted by the volatile organics staff.

Semivolatile Organic Analysis

Four soil/sediment samples were received by the Katahdin GC/MS laboratory on May 5, 1999 for analysis for the TCL list of analytes in accordance with USEPA method 8270B.

The soil samples were extracted following USEPA method 3550 on May 18, 1999. A laboratory control spike, consisting of all TCL analytes spiked into an aliquot of organic free sand, was extracted in the batch. No matrix spike/matrix spike duplicate pair was extracted on the sample in this workorder.

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The initial calibration curves analyzed in this SDG had some of the target analyte %RSD values exceeding 15 %.

Method 8000B, section 7.5.1.2.1 (Revision 2, 12/96) states, "in those instances where the RSD for one or more analytes exceeds 20%, the initial calibration curve may still be acceptable if the mean of the RSD values for all analytes in the calibration is less than or equal to 20%." Section 7.3.7.1 of method 8270C (revision 3, 12/96) narrows this 20% maximum to 15%.

In the calibration curves analyzed in this SDG, the average %RSD for all analytes was 9.2% and 11.4%, making the curves acceptable.

Initial analysis of sample WP2300-2 yielded internal standard area recovery deviations. Reanalysis yielded similar results, confirming matrix interference. Both sets of data are included in this data package.

Initial analysis of sample WP2300-5 yielded internal standard area recovery deviations and a high recovery of the surrogate nitrobenzene-d5. Reanalysis also yielded internal standard area recovery deviations, confirming matrix interference. Both sets of data are included in this data package.

Several manual integrations were performed due to split peaks; all have been flagged with a "M" by the data system. All manual integrations have been dated and initialed by the responsible analyst. Copies of each manual integration are included in the data package. All manual integrations have been reviewed and approved by the GC/MS supervisor.

No other protocol deviations were noted by the semivolatiles organics staff.

Metals Analysis

The samples of Katahdin Work Order WP2300 were prepared and analyzed for metals in accordance with the "Test Methods for Evaluating Solid Waste", SW-846, November 1986, Third Edition.

Inductively-Coupled Plasma (ICP) Atomic Emission Spectroscopic Analysis

Solid-matrix Katahdin Sample Nos. WP2300-(2-4) were digested for ICP analysis on 06/01/99 (QC Batch PF01ICS0) in accordance with USEPA Method 3050B.

ICP analyses of Katahdin Work Order WP2300 sample digestates were performed in accordance with USEPA Method 6010B, using a Thermo Jarrell Ash (TJA) Trace ICP spectrometer and a TJA 61 ICP spectrometer. All samples were analyzed within holding times and all QC criteria were met with the following comments or exceptions:

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Katahdin
ANALYTICAL SERVICES

Some of the results for run QC samples (ICV, ICB, CCV, CCB, ICSA, and ICSAB) included in the accompanying data package may have exceeded acceptance limits for some elements. Please note that all client samples and batch QC samples associated with out-of-control results for run QC samples were subsequently reanalyzed for the analytes in question.

Analysis of Mercury by Cold Vapor Atomic Absorption (CVAA)

Solid-matrix Katahdin Sample Nos. WP2300-(2-4) were digested for mercury analysis on 05/27/99 (QC Batch PE27HGS0) in accordance with USEPA Method 7471A. Katahdin Sample No. WP2300-2 was prepared in duplicate and with a matrix-spiked aliquot.

Mercury analyses of Katahdin Work Order WP2300 sample digestates were performed using a Leeman Labs PS200 automated mercury analyzer. All samples were analyzed within holding times and all run QC criteria were met, with the following comments:

During mercury Run DPE27A, performed on 05/27/99, the instrument automatically recalibrated after the failure of the CCV analyzed at 12:54. This did not affect the analyses of WP2300 samples, which were bracketed by passing run QC samples.

I certify that this data package is in compliance with the terms and conditions of the contract, both technically and for completeness, for other than the conditions detailed above. Release of the data contained in this hardcopy data package has been authorized by the Laboratory Manager and/or his designee, as verified by the following signature.

Maria Croud
Authorized Signature
07/03/99

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KATAHDIN ANALYTICAL SERVICES, INC.
SAMPLE RECEIPT CONDITION REPORT
Tel. (207) 874-2400
Fax (207) 775-4029

LAB (WORK ORDER) #: WP 2300

PAGE: 1 OF 1

COOLER: 1 OF 1

CLIENT: TETRA TECH

COC#: –
SDG#: –
DATE / TIME RECEIVED: 05/05/99 1110
DELIVERED BY: Fed Ex
RECEIVED BY: Sow
LIMS ENTRY BY: AJC
LIMS REVIEW BY / PM: AJC

PROJECT: CNC Charleston

	YES	NO	EXCEPTIONS	COMMENTS	RESOLUTION
1. CUSTODY SEALS PRESENT / INTACT?	☑	☐	☐		
2. CHAIN OF CUSTODY PRESENT IN THIS COOLER?	☑	☐	☐		
3. CHAIN OF CUSTODY SIGNED BY CLIENT?	☑	☐	☐		
4. CHAIN OF CUSTODY MATCHES SAMPLES?	☑	☐	☐		
5. TEMPERATURE BLANKS PRESENT?	☑	☐	☐	TEMP BLANK TEMP (°C)= 0.2	AJC notified Paul Calligan by fax
6. SAMPLES RECEIVED AT 4°C +/- 2? ICE / ICE PACKS PRESENT Y or N?	☐	☑	☐	COOLER TEMP (°C)= NA (RECORD COOLER TEMP ONLY IF TEMP BLANK IS NOT PRESENT)	
7. VOLATILES FREE OF HEADSPACE?	☑	☐	☐		
8. TRIP BLANK PRESENT IN THIS COOLER	☑	☐	☐		
9. PROPER SAMPLE CONTAINERS AND VOLUME?	☑	☐	☐		
10. SAMPLES WITHIN HOLD TIME UPON RECEIPT?	☑	☐	☐		
11. SAMPLES PROPERLY PRESERVED[(1)]?	☑	☐	☐		
12. CORRECTIVE ACTION REPORT FILED?	☐	☑	N/A		

13. ANALYTICAL PROGRAMS (CIRCLE ONE) COMMERCIAL CLP HAZWRAP NFESC ACOE AFCEE OTHER (STATE OF ORIGIN):

LOG - IN NOTES[(1)]:
Temp out of Range – was wrapped under bag of ice

(1) Use this space (and additional sheets if necessary) to document samples that are received broken or compromised, C-O-C discrepancies, radiation checks, residual chlorine check, results of pH check if required. If samples required pH adjustment, record volume and type of preservative added.

000000 6

Katahdin Analytical Services
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Westbrook, ME 04098
Tel: (207) 874-2400
Fax: (207) 775-4029

CHAIN of CUSTODY

PLEASE PRINT IN PEN

Client: Tetra Tech NUS | Contact: BRYN HOWZE | Phone #: (423) 483-9900 | Fax #: ( )

Adr: NH-21 Ave H. | City: N. CHARLESTON | State: SC | Zip Code: 29405

Purchase Order #: | Proj. Name / No.: | Katahdin Quote #:

Bill (if different than above): 0124 | Address:

Sampler (Print / Sign): GREG SISCO / G.A. Sisco | Copies To:

LAB USE ONLY | WORK ORDER #: WP2300

KATAHDIN PROJECT MANAGER

REMARKS:

SHIPPING INFO: ☐ FED EX ☐ UPS ☐ CLIENT

AIRBILL NO:

TEMP°C ☐ TEMP BLANK ☐ INTACT ☐ NOT INTACT

ANALYSIS AND CONTAINER TYPE PRESERVATIVES

Sample Description	Date / Time coll'd	Matrix	No. of Cntrs.	PAH's + Naph. 8270 C	TAL Metals 6010 B	BTEX 8260B EN-CORE 9071A							FID headspace (PPM)
19TL00101	5-3 / 1515	W	2										
19SLB11-0405	5-4 / 1330	S	6	X	X	X							400
19SLB10-0405	5-4 / 1415	S	5	X		X							180
18SLB03-0405	5-4 / 1500	S	6	X	X	X							3
SLB04-0405	5-4 / 1600	S	6	X	X	X							20
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COMMENTS

Relinquished By: (Signature)	Date / Time	Received By: (Signature)	Relinquished By: (Signature)	Date / Time	Received By: (Signature)
G. Sisco	5-4 / 1830	Shelley Wilkinson 5-5-99 1110			
Relinquished By: (Signature)	Date / Time	Received By: (Signature)	Relinquished By: (Signature)	Date / Time	Received By: (Signature)

KATAHDIN ANALYTICAL SERVICES

REPORT OF ANALYTICAL RESULTS

Client:	Arnold Lamb Tetra Tech NUS 794 South Military Trail Deerfield Beach, FL 33442	**Lab Number:**	WP2300-3
		SDG:	WP2300
		Report Date:	6/9/99
		PO No. :	N7912-P99264
		Project:	CTO #68
Proj. ID:	CNC CHARLESTON	**% Solids:**	89
		Method:	SW8260
		Date Analyzed:	5/13/99

Sample Description	Matrix	Sampled Date	Rec'd Date	Ext. Date	Ext'd By	Ext. Method	Analyst
18SLB03-0405	SL	5/4/99	5/5/99	5/13/99	KMC	5035	KMC

Compound	Result	Units	DF	Sample PQL	Method PQL
BENZENE	<6	ug/Kg	1.2	6	5
TOLUENE	<6	ug/Kg	1.2	6	5
1,2-DIBROMOETHANE	<6	ug/Kg	1.2	6	5
ETHYLBENZENE	<6	ug/Kg	1.2	6	5
NAPHTHALENE	J5	ug/Kg	1.2	6	5
MTBE	<6	ug/Kg	1.2	6	5
TOTAL XYLENES	<6	ug/Kg	1.2	6	5
DIBROMOFLUOROMETHANE	116	%	1.2		
1,2-DICHLOROETHANE-D4	106	%	1.2		
TOLUENE-D8	114	%	1.2		
P-BROMOFLUOROBENZENE	123	%	1.2		

Report Notes: J,Analyzed outside of 12 hr BFB window by 35 minutes

KATAHDIN ANALYTICAL SERVICES
REPORT OF ANALYTICAL RESULTS

Client:	Arnold Lamb Tetra Tech NUS 794 South Military Trail Deerfield Beach, FL 33442	**Lab Number:**	WP2300-3RA
		SDG:	WP2300
		Report Date:	6/9/99
		PO No. :	N7912-P99264
		Project:	CTO #68
Proj. ID:	CNC CHARLESTON	**% Solids:**	89
		Method:	SW8260
		Date Analyzed:	5/14/99

Sample Description	Matrix	Sampled Date	Rec'd Date	Ext. Date	Ext'd By	Ext. Method	Analyst
18SLB03-0405	SL	5/4/99	5/5/99	5/14/99	KMC	5035	KMC

Compound	Result	Units	DF	Sample PQL	Method PQL
BENZENE	<5	ug/Kg	0.92	5	5
TOLUENE	<5	ug/Kg	0.92	5	5
1,2-DIBROMOETHANE	<5	ug/Kg	0.92	5	5
ETHYLBENZENE	<5	ug/Kg	0.92	5	5
NAPHTHALENE	<5	ug/Kg	0.92	5	5
MTBE	<5	ug/Kg	0.92	5	5
TOTAL XYLENES	<5	ug/Kg	0.92	5	5
DIBROMOFLUOROMETHANE	105	%	0.92		
1,2-DICHLOROETHANE-D4	100	%	0.92		
LUENE-D8	$68	%	0.92		
, -BROMOFLUOROBENZENE	$51	%	0.92		

,port Notes: $, O-13

KATAHDIN ANALYTICAL SERVICES
REPORT OF ANALYTICAL RESULTS

Client:	Paul Calligan Tetra Tech NUS 1401 Oven Park Dr. Suite 102 Tallahassee, FL 32308	**Lab Number:**	WP2300-3
		SDG:	WP2300
		Report Date:	6/30/99
		PO No. :	N7912-P99264
		Project:	CTO #68
Proj. ID:	CNC CHARLESTON	**% Solids:**	89
		Method:	EPA 8270
		Date Analyzed:	6/25/99

Sample Description	Matrix	Sampled Date	Rec'd Date	Ext. Date	Ext'd By	Ext. Method	Analyst
18SLB03-0405	SL	5/4/99	5/5/99	5/18/99	GST	SW3550	SW

Compound	Result	Units	DF	Sample PQL	Method PQL
NAPHTHALENE	<360	ug/Kg	1.1	360	330
2-METHYLNAPHTHALENE	<360	ug/Kg	1.1	360	330
ACENAPHTHYLENE	<360	ug/Kg	1.1	360	330
ACENAPHTHENE	<360	ug/Kg	1.1	360	330
FLUORENE	<360	ug/Kg	1.1	360	330
PHENANTHRENE	<360	ug/Kg	1.1	360	330
ANTHRACENE	<360	ug/Kg	1.1	360	330
FLUORANTHENE	<360	ug/Kg	1.1	360	330
PYRENE	<360	ug/Kg	1.1	360	330
BENZO[A]ANTHRACENE	<360	ug/Kg	1.1	360	330
CHRYSENE	<360	ug/Kg	1.1	360	330
BENZO[B]FLUORANTHENE	<360	ug/Kg	1.1	360	330
BENZO[K]FLUORANTHENE	<360	ug/Kg	1.1	360	330
BENZO[A]PYRENE	<360	ug/Kg	1.1	360	330
INDENO[1,2,3-CD]PYRENE	<360	ug/Kg	1.1	360	330
DIBENZ[A,H]ANTHRACENE	<360	ug/Kg	1.1	360	330
BENZO[G,H,I]PERYLENE	<360	ug/Kg	1.1	360	330
NITROBENZENE-D5	68	%	1.1		
2-FLUOROBIPHENYL	68	%	1.1		
TERPHENYL-D14	108	%	1.1		

Report Notes:

INORGANIC ANALYSIS DATA SHEET

Lab Name: Katahdin Analytical Services **Client Field ID:** 18SLB03-0405

Matrix: SOIL **SDG Name:** WP2300

Percent Solids: 89.2 **Lab Sample ID:** WP2300-003

Concentration Units (ug/L or mg/Kg dry weight): mg/Kg

CAS No.	Analyte	Concentration	C	Q	M	DF
7429-90-5	ALUMINUM	2700			P	1
7440-36-0	ANTIMONY	0.15	U		P	1
7440-38-2	ARSENIC	2.8			P	1
7440-39-3	BARIUM	8.1			P	1
7440-41-7	BERYLLIUM	0.05	B		P	1
7440-43-9	CADMIUM	0.16	U		P	1
7440-70-2	CALCIUM	126			P	1
7440-47-3	CHROMIUM	4.0			P	1
7440-48-4	COBALT	0.36	U		P	1
7440-50-8	COPPER	1.8	B		P	1
7439-89-6	IRON	2470			P	1
7439-92-1	LEAD	3.8			P	1
7439-95-4	MAGNESIUM	122			P	1
7439-96-5	MANGANESE	4.6			P	1
7439-97-6	MERCURY	0.01	U		CV	1
7440-02-0	NICKEL	0.63	B		P	1
7440-09-7	POTASSIUM	145			P	1
7782-49-2	SELENIUM	0.21	U		P	1
7440-22-4	SILVER	0.21	U		P	1
7440-23-5	SODIUM	14.7			P	1
7440-28-0	THALLIUM	0.37	U		P	1
7440-62-2	VANADIUM	5.2			P	1
7440-66-6	ZINC	3.1			P	1

Color Before: BROWN Texture: MEDIUM

Color After: YELLOW Clarity After: CLEAR

Comments:

Client:	Katahdin Analytical 340 County Road Westbrook, Maine 04092
Contact:	Ms. Andrea Colby
Project Description:	Former Naval Complex

cc: KATA00199 Report Date: May 27, 1999

Sample ID	: 18SLB03-0405
Lab ID	: 9905110-02
Matrix	: Soil
Date Collected	: 05/04/99
Date Received	: 05/04/99
Priority	: Routine
Collector	: Client

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
General Chemistry											
Total Rec. Petro. Hydrocarbons		370	112	224	mg/kg	1.0	AAT	05/26/99	1000	150070	1
Evaporative Loss @ 105 C		11.0	1.00	1.00	wt%	1.0	GJ	05/05/99	1625	148401	2

M = Method	Method-Description
M 1	SW846 9071A
M 2	EPA 3550

Notes:
The qualifiers in this report are defined as follows:
ND indicates that the analyte was not detected at a concentration greater than the detection limit.
J indicates presence of analyte at a concentration less than the reporting limit (RL) and greater than the detection limit (DL).
U indicates that the analyte was not detected at a concentration greater than the detection limit.
* indicates that a quality control analyte recovery is outside of specified acceptance criteria.

Data reported in mass/mass units is reported as 'dry weight'.

This data report has been prepared and reviewed
in accordance with General Engineering Laboratories
standard operating procedures. Please direct
any questions to your Project Manager, Valerie Davis at (843) 769-7391.

Reviewed By

KATAHDIN ANALYTICAL SERVICES
REPORT OF ANALYTICAL RESULTS

Client:	Arnold Lamb	**Lab Number:**	WP2300-4
	Tetra Tech NUS	**SDG:**	WP2300
	794 South Military Trail	**Report Date:**	6/9/99
		PO No. :	N7912-P99264
	Deerfield Beach, FL 33442	**Project:**	CTO #68
Proj. ID:	CNC CHARLESTON	**% Solids:**	91
		Method:	SW8260
		Date Analyzed:	5/15/99

Sample Description	Matrix	Sampled Date	Rec'd Date	Ext. Date	Ext'd By	Ext. Method	Analyst
18SLB04-0405	SL	5/4/99	5/5/99	5/15/99	JSS	5035	JSS

Compound	Result	Units	DF	Sample PQL	Method PQL
BENZENE	<6	ug/Kg	1.2	6	5
TOLUENE	<6	ug/Kg	1.2	6	5
1,2-DIBROMOETHANE	<6	ug/Kg	1.2	6	5
ETHYLBENZENE	<6	ug/Kg	1.2	6	5
NAPHTHALENE	<6	ug/Kg	1.2	6	5
MTBE	<6	ug/Kg	1.2	6	5
TOTAL XYLENES	<6	ug/Kg	1.2	6	5
DIBROMOFLUOROMETHANE	$223	%	1.2		
1,2-DICHLOROETHANE-D4	$222	%	1.2		
)LUENE-D8	$198	%	1.2		
-BROMOFLUOROBENZENE	$161	%	1.2		

port Notes: $

KATAHDIN ANALYTICAL SERVICES
REPORT OF ANALYTICAL RESULTS

Client: Arnold Lamb
Tetra Tech NUS
794 South Military Trail

Deerfield Beach, FL 33442

Proj. ID: CNC CHARLESTON

Lab Number: WP2300-4RA
SDG: WP2300
Report Date: 6/9/99
PO No. : N7912-P99264
Project: CTO #68
% Solids: 91
Method: SW8260
Date Analyzed: 5/15/99

Sample Description	Matrix	Sampled Date	Rec'd Date	Ext. Date	Ext'd By	Ext. Method	Analyst
18SLB04-0405	SL	5/4/99	5/5/99	5/15/99	JSS	5035	JSS

Compound	Result	Units	DF	Sample PQL	Method PQL
BENZENE	<6	ug/Kg	1.2	6	5
TOLUENE	<6	ug/Kg	1.2	6	5
1,2-DIBROMOETHANE	<6	ug/Kg	1.2	6	5
ETHYLBENZENE	<6	ug/Kg	1.2	6	5
NAPHTHALENE	<6	ug/Kg	1.2	6	5
MTBE	<6	ug/Kg	1.2	6	5
TOTAL XYLENES	<6	ug/Kg	1.2	6	5
DIBROMOFLUOROMETHANE	131	%	1.2		
1,2-DICHLOROETHANE-D4	124	%	1.2		
TOLUENE-D8	114	%	1.2		
P-BROMOFLUOROBENZENE	87	%	1.2		

Report Notes: O-13

KATAHDIN ANALYTICAL SERVICES
REPORT OF ANALYTICAL RESULTS

Client:	Paul Calligan Tetra Tech NUS 1401 Oven Park Dr. Suite 102 Tallahassee, FL 32308	**Lab Number:**	WP2300-4
		SDG:	WP2300
		Report Date:	6/30/99
		PO No. :	N7912-P99264
		Project:	CTO #68
Proj. ID:	CNC CHARLESTON	**% Solids:**	91
		Method:	EPA 8270
		Date Analyzed:	6/24/99

Sample Description	Matrix	Sampled Date	Rec'd Date	Ext. Date	Ext'd By	Ext. Method	Analyst
18SLB04-0405	SL	5/4/99	5/5/99	5/18/99	GST	SW3550	SW

Compound	Result	Units	DF	Sample PQL	Method PQL
NAPHTHALENE	<360	ug/Kg	1.1	360	330
2-METHYLNAPHTHALENE	<360	ug/Kg	1.1	360	330
ACENAPHTHYLENE	<360	ug/Kg	1.1	360	330
ACENAPHTHENE	<360	ug/Kg	1.1	360	330
FLUORENE	<360	ug/Kg	1.1	360	330
PHENANTHRENE	<360	ug/Kg	1.1	360	330
ANTHRACENE	<360	ug/Kg	1.1	360	330
FLUORANTHENE	<360	ug/Kg	1.1	360	330
PYRENE	<360	ug/Kg	1.1	360	330
ZO[A]ANTHRACENE	<360	ug/Kg	1.1	360	330
CHRYSENE	<360	ug/Kg	1.1	360	330
BENZO[B]FLUORANTHENE	<360	ug/Kg	1.1	360	330
BENZO[K]FLUORANTHENE	<360	ug/Kg	1.1	360	330
BENZO[A]PYRENE	<360	ug/Kg	1.1	360	330
INDENO[1,2,3-CD]PYRENE	<360	ug/Kg	1.1	360	330
DIBENZ[A,H]ANTHRACENE	<360	ug/Kg	1.1	360	330
BENZO[G,H,I]PERYLENE	<360	ug/Kg	1.1	360	330
NITROBENZENE-D5	82	%	1.1		
2-FLUOROBIPHENYL	84	%	1.1		
TERPHENYL-D14	116	%	1.1		

rt Notes:

Client:	Katahdin Analytical 340 County Road Westbrook, Maine 04092
Contact:	Ms. Andrea Colby
Project Description:	Former Naval Complex

cc: KATA00199 Report Date: May 27, 1999

Sample ID	: 18SLB04-0405
Lab ID	: 9905110-01
Matrix	: Soil
Date Collected	: 05/04/99
Date Received	: 05/04/99
Priority	: Routine
Collector	: Client

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
General Chemistry											
Total Rec. Petro. Hydrocarbons		235	112	224	mg/kg	1.0	AAT	05/26/99	1000	150070	1
Evaporative Loss @ 105 C		11.0	1.00	1.00	wt%	1.0	GJ	05/05/99	1625	148401	2

M - Method	Method-Description
M 1	SW846 9071A
M 2	EPA 3550

Notes:
The qualifiers in this report are defined as follows:
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* indicates that a quality control analyte recovery is outside of specified acceptance criteria.

Data reported in mass/mass units is reported as 'dry weight'.

This data report has been prepared and reviewed
in accordance with General Engineering Laboratories
standard operating procedures. Please direct
any questions to your Project Manager, Valerie Davis at (843) 769-7391.

Reviewed By

INORGANIC ANALYSIS DATA SHEET

Lab Name: Katahdin Analytical Services
Client Field ID: 18SLB04-0405
Matrix: SOIL
SDG Name: WP2300
Percent Solids: 91.0
Lab Sample ID: WP2300-004

Concentration Units (ug/L or mg/Kg dry weight): mg/Kg

CAS No.	Analyte	Concentration	C	Q	M	DF
7429-90-5	ALUMINUM	2860			P	1
7440-36-0	ANTIMONY	0.21	B		P	1
7440-38-2	ARSENIC	11.9			P	1
7440-39-3	BARIUM	22.8			P	1
7440-41-7	BERYLLIUM	0.32	B		P	1
7440-43-9	CADMIUM	0.40	B		P	1
7440-70-2	CALCIUM	5390			P	1
7440-47-3	CHROMIUM	9.6			P	1
7440-48-4	COBALT	1.5	B		P	1
7440-50-8	COPPER	34.1			P	1
7439-89-6	IRON	4800			P	1
7439-92-1	LEAD	24.5			P	1
7439-95-4	MAGNESIUM	376			P	1
7439-96-5	MANGANESE	23.2			P	1
7439-97-6	MERCURY	0.11			CV	1
7440-02-0	NICKEL	7.7			P	1
7440-09-7	POTASSIUM	243			P	1
7782-49-2	SELENIUM	0.25	U		P	1
7440-22-4	SILVER	0.25	U		P	1
7440-23-5	SODIUM	56.5			P	1
7440-28-0	THALLIUM	0.44	U		P	1
7440-62-2	VANADIUM	17.4			P	1
7440-66-6	ZINC	34.3			P	1

Color Before: BROWN
Texture: MEDIUM
Color After: YELLOW
Clarity After: CLEAR
Comments:

Katahdin
ANALYTICAL SERVICES

SDG NARRATIVE
KATAHDIN ANALYTICAL SERVICES
TETRA TECH NUS
CASE CNC CHARLESTON

Sample Receipt

The following samples were received on May 18, 1999 and were logged in under Katahdin Analytical Services work order number WP2490 for a hardcopy due date of June 17, 1999.

KATAHDIN Sample No.	TTNUS Sample Identification	GEL Sample No.
WP2490-1	16SLB01-0203	
WP2490-2	16SLB02-0203	
WP2490-3	16SLB02-0203D	
WP2490-4	16SLB05-0203	
WP2490-5	17SLB01-0708	
WP2490-6	17SLB07-0809	
WP2490-7	17SLB02-0809	
WP2490-8	17SLB09-0708	
WP2490-9	17SLB04-0304	
WP2490-11	17SLB05-0708D	
WP2490-12	17SLB05-0708	
WP2490-13	17SLB03-0506	9905606-01
WP2490-14	18SLB03-00506D	9905606-02
WP2490-15	17SLB03-0506A	
WP2490-16	17SLB03-0506B	
WP2490-17	18SLB03-0304	
WP2490-18	19SLB16-0203	9905606-03
WP2490-19	01TL00103	

The samples were logged in for the analyses specified on the chain of custody form. All problems encountered and resolved during sample receipt have been documented on the applicable chain of custody forms.

Sample analyses have been performed by the methods as noted herein.

Volatile Organic Analysis

One aqueous (trip blank) and thirteen soil/sediment samples were received by the Katahdin Analytical Services, Inc. GC/MS laboratory on May 18, 1999 and were specified to be analyzed by USEPA method 8260B for the analytes benzene, toluene, ethylbenzene, xylenes, MTBE, naphthalene, and EDB.

Analyses for this SDG were performed on instruments 5972-M (low level soil), 5972-Z(low level soil), and 5972-F (aqueous). A VSTD050 (50 ppb standard) was used for the continuing calibration standard. Internal standard and surrogate compounds were also spiked at 50 ug/l.

Batch QC (VBLK, and LCS) was performed in each twelve hour window. Results are included in this data package. The LCS QC samples were spiked with the entire list of compounds quantitated for at 50 ppb. No matrix spike/matrix spike duplicate pair was analyzed on any of the samples in this workorder.

Method 8000B, section 7.5.1.2.1 (Revision 2, 12/96) states, "in those instances where the RSD for one or more analytes exceeds 20%, the initial calibration curve may still be acceptable if the mean of the RSD values for all analytes in the calibration is less than or equal to 20%." Method 8260B narrows this 20% maximum to 15%.

In the calibration curves analyzed in this SDG, several analytes had %RSD values exceeding the allowed 15%. Since the average %RSD for all analytes was 8.4%, 13.4%, and 14.1%, the curves were acceptable.

Initial analyses of samples WP2490-1, WP2490-3, WP2490-5, and WP2490-13 yielded internal standard area and/or surrogate recovery deviations. Reanalyses yielded similar results, confirming matrix interference. Both sets of data for each sample are included in this data package.

Several manual integrations were performed due to split peaks; all have been flagged with a "M" (software-generated) on the pertinent quantitation reports. All "M" flags have been dated and initialed by the analyst performing the integration. In addition, all "M" flags have been reviewed and approved by the GC/MS supervisor. Copies of each manual integration are included in the pertinent quantitation reports.

No other protocol deviations were noted by the volatile organics staff.

Semivolatile Organic Analysis

Thirteen soil/sediment samples were received by the Katahdin GC/MS laboratory on May 18, 1999 for analysis in accordance with 8270C for the TCL/PAH list of analytes.

Extraction of all of the soil samples occurred following USEPA method 3550 on May 25, 1999. A laboratory control spike consisting of all TCL analytes spiked into organic free sand, was extracted in the batch along with a site specific MS/MSD pair on sample WP2490-9.

WP2490-9MS and 9MSD showed an elevated recovery for the surrogate terphenyl-d14, and low recovery of the internal standard Perylene-d12. No action was taken in accordance with the method.

Samples WP2490-8,12, and 13 yielded internal standard area recovery deviations. Reanalysis confirmed the internal standard deviations confirming matrix interference. Both sets of data for this sample are included in the data package.

The initial calibration curves analyzed in this SDG had some of the target analyte %RSD values exceeding 15 %.

Method 8000B, section 7.5.1.2.1 (Revision 2, 12/96) states, "in those instances where the RSD for one or more analytes exceeds 20%, the initial calibration curve may still be acceptable if the mean of the RSD values for all analytes in the calibration is less than or equal to 20%." Section 7.3.7.1 of method 8270C (revision 3, 12/96) narrows this 20% maximum to 15%.

In the calibration curves analyzed for this workorder, the average %RSD for all analytes were as follows:

5970-I	6/22/99	8.2%
5970-I	6/28/99	8.7%

Several manual integrations were performed due to split peaks; all have been flagged with a "M" by the data system. All manual integrations have been dated and initialed by the responsible analyst. Copies of each manual integration are included in the data package. All manual integrations have been reviewed and approved by the GC/MS supervisor.

No other protocol deviations were noted by the semivolatiles organics staff.

Wet Chemistry Analysis

For work order WP2490 the analyses for Total Combustible Organics (TCO) have been performed in accordance with the "Annual Book of ASTM Standards", 1987. Analyses for Solids-Total Residue (TS) for work order WP2490 samples have been performed in accordance with "Contract Laboratory Program Statement of Work for Inorganic Analysis".

All analyses were performed within analytical hold time. No protocol deviations were noted by the Wet Chemistry laboratory staff.

I certify that this data package is in compliance with the terms and conditions of the contract, both technically and for completeness, for other than the conditions detailed above. Release of the data contained in this hardcopy data package has been authorized by the Laboratory Manager and/or his designee, as verified by the following signature.

Authorized Signature

KATAHDIN ANALYTICAL SERVICES, INC.
SAMPLE RECEIPT CONDITION REPORT

Tel. (207) 874-2400
Fax (207) 775-4029

LAB (WORK ORDER) #: WP2490

PAGE: 1 OF 2

COOLER: 1 OF 2

CLIENT: Tetratech -SC

PROJECT: CNC Charleston

COC#: –
SDG#: –
DATE / TIME RECEIVED: 05/18/99 ~1010
DELIVERED BY: FEDEX
RECEIVED BY: BKR
LIMS ENTRY BY: Sov
LIMS REVIEW BY / PM: ADC

	YES	NO	EXCEPTIONS	COMMENTS	RESOLUTION
1. CUSTODY SEALS PRESENT / INTACT?	☑	☐	☐		
2. CHAIN OF CUSTODY PRESENT IN THIS COOLER?	☑	☐	☐		
3. CHAIN OF CUSTODY SIGNED BY CLIENT?	☑	☐	☐		
4. CHAIN OF CUSTODY MATCHES SAMPLES?	☑	☐	☐		
5. TEMPERATURE BLANKS PRESENT?	☑	☐	☐	TEMP BLANK TEMP (°C)= 1.1	ADC notified Paul Calligan by fax 5/18/99
6. SAMPLES RECEIVED AT 4°C +/- 2? ICE / ICE PACKS PRESENT Y or N?	☐	☑	☐	COOLER TEMP (°C)= NA (RECORD COOLER TEMP ONLY IF TEMP BLANK IS NOT PRESENT)	
7. VOLATILES FREE OF HEADSPACE?	☑	☐	☐		
8. TRIP BLANK PRESENT IN THIS COOLER	☑	☐	☐		
9. PROPER SAMPLE CONTAINERS AND VOLUME?	☑	☐	☐		
10. SAMPLES WITHIN HOLD TIME UPON RECEIPT?	☑	☐	☐		
11. SAMPLES PROPERLY PRESERVED[1]?	☑	☐	☐		
12. CORRECTIVE ACTION REPORT FILED?	☐	☑	N/A		

13. ANALYTICAL PROGRAMS (CIRCLE ONE) COMMERCIAL CLP HAZWRAP NFESC ACOE AFCEE OTHER (STATE OF ORIGIN): ____

LOG - IN NOTES[1]:

(1) Use this space (and additional sheets if necessary) to document samples that are received broken or compromised, C-O-C discrepancies, radiation checks, residual chlorine check, results of pH check if required. If samples required pH adjustment, record volume and type of preservative added.

KATAHDIN ANALYTICAL SERVICES, INC.
SAMPLE RECEIPT CONDITION REPORT

Tel. (207) 874-2400
Fax (207) 775-4029

LAB (WORK ORDER) # WP2490

PAGE: 2 OF 2

COOLER: 2 OF 2

CLIENT: Tetratech - SC

COC# —
SDG# —
DATE / TIME RECEIVED: 05/18/99~1010
DELIVERED BY: FEDEX
RECEIVED BY: BKR
LIMS ENTRY BY: SAW
LIMS REVIEW BY / PM: AC

PROJECT: CNC Charleston

	YES	NO	EXCEPTIONS	COMMENTS	RESOLUTION
1. CUSTODY SEALS PRESENT / INTACT?	☑	☐	☐		
2. CHAIN OF CUSTODY PRESENT IN THIS COOLER?	☑	☐	☐		
3. CHAIN OF CUSTODY SIGNED BY CLIENT?	☑	☐	☐		
4. CHAIN OF CUSTODY MATCHES SAMPLES?	☑	☐	☐		
5. TEMPERATURE BLANKS PRESENT?	☑	☐	☐	TEMP BLANK TEMP (°C)= 4.1	
6. SAMPLES RECEIVED AT 4°C +/- 2? ICE/ICE PACKS PRESENT Y or N?	☑	☐	☐	COOLER TEMP (°C)= NA (RECORD COOLER TEMP ONLY IF TEMP BLANK IS NOT PRESENT)	
7. VOLATILES FREE OF HEADSPACE?	☐	☐	☑		
8. TRIP BLANK PRESENT IN THIS COOLER	☐	☑	☐		
9. PROPER SAMPLE CONTAINERS AND VOLUME?	☑	☐	☐		
10. SAMPLES WITHIN HOLD TIME UPON RECEIPT?	☑	☐	☐		
11. SAMPLES PROPERLY PRESERVED[1]?	☑	☐	☐		
12. CORRECTIVE ACTION REPORT FILED?	☐	☑	N/A		

13. ANALYTICAL PROGRAMS (CIRCLE ONE) COMMERCIAL CLP HAZWRAP NFESC ACOE AFCEE OTHER (STATE OF ORIGIN):

LOG - IN NOTES[1]:

[1] Use this space (and additional sheets if necessary) to document samples that are received broken or compromised, C-O-C discrepancies, radiation checks, residual chlorine check, results of pH check if required. If samples required pH adjustment, record volume and type of preservative

Katahdin ANALYTICAL SERVICES
P.O. Box 720
Westbrook, ME 04098
Tel: (207) 874-2400
Fax: (207) 775-4029

CHAIN of CUSTODY

PLEASE PRINT IN PEN

Client: Tetra Tech NUS | Contact: Bryn Howze | Phone #: (423) 483-9900 | Fax #: ( )

Address: NH-21 Ave. H | City: North Charleston | State: SC | Zip Code: 29405

Purchase Order #: | Proj. Name / No.: | Katahdin Quote #:

Bill (if different than above): | Address:

Sampler (Print / Sign): | Copies To:

LAB USE ONLY WORK ORDER #: WP2490

KATAHDIN PROJECT MANAGER:

REMARKS:

SHIPPING INFO: ☐ FED EX ☐ UPS ☐ CLIENT

AIRBILL NO.:

TEMP°C: ☐ TEMP BLANK ☐ INTACT ☐ NOT INTACT

ANALYSIS AND CONTAINER TYPE PRESERVATIVES

*	Sample Description	Date / Time coll'd	Matrix	No. of Cntrs.	PAHs + Napth 8070C	TAL metals 6010B	BTEX, EDB 8260B 9071A	Grain Size Hydrometer						FID headspace (...)
	16SLB01-0203	5/17/0810	S	5	X		X							80
	16SLB02-0203	5/17/0825	S	5	X		X							20
	16SLB02-0203D	5/17/0825	S	5	X		X							20
	16SLB05-0203	5/17/0845	S	5	X		X							90
	17SLB01-0708	5/17/1050	S	5	X		X							1
	17SLB07-0809	5/17/1140	S	5	X		X							0
	17SLB02-0809	5/17/1105	S	5	X		X							5
	17SLB09-0708	5/17/1425	S	5	X		X							3
	17SLB04-0304	5/17/1115	S	5	X		X							0
	17SLB04-0304MS	5/17/1115	S	5	X		X							0
	17SLB05-0708D	5/17/1200	S	5	X		X							3
	17SLB05-0708	5/17/1200	S	5	X		X							3
	17SLB03-0506	5/17/1210	S	7	X		X	X						1
	18SLB03-0506D	5/17/1550	S	5	X		X							1
	18SLB03-0304	5/17/1550	S	1				X						
	01TL00103	5/3/1515	W	2			X							

COMMENTS
Grain Size for 17SLB03-0506 are labeled with A & B at the end of the sample ID

Relinquished By: (Signature)	Date / Time	Received By: (Signature)	Relinquished By: (Signature)	Date / Time	Received By: (Signature)
[signature]	5/17/99 1752	809609650298	[signature]	5/18/99 1010	[signature]
Relinquished By: (Signature)	Date / Time	Received By: (Signature)	Relinquished By: (Signature)	Date / Time	Received By: (Signature)

KATAHDIN ANALYTICAL SERVICES
REPORT OF ANALYTICAL RESULTS

Client:	Paul Calligan Tetra Tech NUS 1401 Oven Park Dr. Suite 102 Tallahassee, FL 32308	**Lab Number:**	WP2490-19
		SDG:	WP2490
		Report Date:	6/16/99
		PO No. :	N7912-P99264
		Project:	CTO #68
Proj. ID:	CNC CHARLESTON	**% Solids:**	N/A
		Method:	SW8260
		Date Analyzed:	5/26/99

Sample Description	Matrix	Sampled Date	Rec'd Date	Ext. Date	Ext'd By	Ext. Method	Analyst
01TL00103 (trip)	AQ	5/3/99	5/18/99	5/26/99	JSS	5030	JSS

Compound	Result	Units	DF	Sample PQL	Method PQL
BENZENE	<5	ug/L	1.0	5	5
TOLUENE	<5	ug/L	1.0	5	5
1,2-DIBROMOETHANE	<5	ug/L	1.0	5	5
ETHYLBENZENE	<5	ug/L	1.0	5	5
NAPHTHALENE	<5	ug/L	1.0	5	5
MTBE	<5	ug/L	1.0	5	5
TOTAL XYLENES	<5	ug/L	1.0	5	5
DIBROMOFLUOROMETHANE	83	%	1.0		
1,2-DICHLOROETHANE-D4	80	%	1.0		
TOLUENE-D8	86	%	1.0		
P-BROMOFLUOROBENZENE	81	%	1.0		

Report Notes:

KATAHDIN ANALYTICAL SERVICES
REPORT OF ANALYTICAL RESULTS

Client:	Paul Calligan Tetra Tech NUS 1401 Oven Park Dr. Suite 102 Tallahassee, FL 32308	**Lab Number:**	WP2490-14
		SDG:	WP2490
		Report Date:	7/8/99
		PO No. :	N7912-P99264
		Project:	CTO #68
		% Solids:	90
Proj. ID:	CNC CHARLESTON	**Method:**	EPA 8270
		Date Analyzed:	6/29/99

Sample Description	Matrix	Sampled Date	Rec'd Date	Ext. Date	Ext'd By	Ext. Method	Analyst
18SLB03-0506D	SL	5/17/99	5/18/99	5/25/99	DPD	EPA 3550	KRT

Compound	Result	Units	DF	Sample PQL	Method PQL
NAPHTHALENE	<400	ug/Kg	1.2	400	330
2-METHYLNAPHTHALENE	<400	ug/Kg	1.2	400	330
ACENAPHTHYLENE	<400	ug/Kg	1.2	400	330
ACENAPHTHENE	<400	ug/Kg	1.2	400	330
FLUORENE	<400	ug/Kg	1.2	400	330
PHENANTHRENE	<400	ug/Kg	1.2	400	330
ANTHRACENE	<400	ug/Kg	1.2	400	330
FLUORANTHENE	<400	ug/Kg	1.2	400	330
PYRENE	<400	ug/Kg	1.2	400	330
BENZO[A]ANTHRACENE	<400	ug/Kg	1.2	400	330
YSENE	<400	ug/Kg	1.2	400	330
...NZO[B]FLUORANTHENE	<400	ug/Kg	1.2	400	330
BENZO[K]FLUORANTHENE	<400	ug/Kg	1.2	400	330
BENZO[A]PYRENE	<400	ug/Kg	1.2	400	330
INDENO[1,2,3-CD]PYRENE	<400	ug/Kg	1.2	400	330
DIBENZ[A,H]ANTHRACENE	<400	ug/Kg	1.2	400	330
BENZO[G,H,I]PERYLENE	<400	ug/Kg	1.2	400	330
NITROBENZENE-D5	30	%	1.2		
2-FLUOROBIPHENYL	33	%	1.2		
TERPHENYL-D14	33	%	1.2		

r rt Notes:

Katahdin
ANALYTICAL SERVICES

Lab Number : WP-2490-14
Report Date: 07/09/99
PO No. : N7912-P99264
Project : CTO #68

CLIENT: Paul Calligan
Tetra Tech NUS
1401 Oven Park Dr., Suite 102
Tallahassee, FL 32308

WIC#: CNC CHARLESTON

REPORT OF ANALYTICAL RESULTS

SAMPLE DESCRIPTION	MATRIX	SAMPLED BY	SAMPLED DATE	RECEIVED
18SLB03-0506D	Solid	CLIENT	05/17/99	05/18/99

PARAMETER	RESULT	UNITS	DF	*PQL	METHOD	ANALYZED	BY	NOTES
Solids-Total Residue (TS)	90.	wt %	1.0	0.10	CLP/CIP SOW	05/19/99	JF	1
Total Combustible Organics	1.6	wt %	1.0	0.1	ASTM D2974-8	06/07/99	JF	2

*PQL (Practical Quantitation Level) represents laboratory reporting limits and may not reflect sample-specific reporting limits. Sample-specific limits are indicated by results annotated with '<' values.
(1) Sample Preparation on 05/18/99 by JF
(2) Sample Preparation on 06/04/99 by JF

07/09/99

LJO/baeajc(dw)/msm
PE18TSS8
CC: MS. LEE LECK
TETRA TECH NUS
FOSTER PALZA 7
661 ANDERSEN DR.

Client:	Katahdin Analytical 340 County Road Westbrook, Maine 04092
Contact:	Ms. Andrea Colby
Project Description:	Former Naval Complex

cc: KATA00199 Report Date: June 11, 1999

Sample ID	: 18SLB03-0506
Lab ID	: 9905606-02
Matrix	: Soil
Date Collected	: 05/17/99
Date Received	: 05/18/99
Priority	: Routine
Collector	: Client

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
General Chemistry											
Evaporative Loss @ 105 C		11.0	1.00	1.00	wt%	1.0	GJ	05/19/99	1540	149550	1
Total Organic Carbon		2490	43.1	100	mg/kg	1.0	LS	05/28/99	1151	150121	2

M = Method	Method-Description
M 1	EPA 3550
M 2	SW846 9060 Modified

Notes:
The qualifiers in this report are defined as follows:
ND indicates that the analyte was not detected at a concentration greater than the detection limit.
J indicates presence of analyte at a concentration less than the reporting limit (RL) and greater than the detection limit (DL).
U indicates that the analyte was not detected at a concentration greater than the detection limit.
* indicates that a quality control analyte recovery is outside of specified acceptance criteria.

Data reported in mass/mass units is reported as 'dry weight'.

This data report has been prepared and reviewed
in accordance with General Engineering Laboratories
standard operating procedures. Please direct
any questions to your Project Manager, Valerie Davis at (843) 769-7391.

Reviewed By

Katahdin
ANALYTICAL SERVICES

SDG NARRATIVE
KATAHDIN ANALYTICAL SERVICES
TETRA TECH NUS
CASE CNC CHARLESTON

Sample Receipt

The following samples were received on May 15, 1999 and were logged in under Katahdin Analytical Services work order number WP2474 for a hardcopy due date of June 14, 1999.

KATAHDIN Sample No.	TTNUS Sample Identification	GEL Sample No.
WP2474-1	18SLB05-0406	9905519-03
WP2474-2	18SLB01-0203	9905519-02
WP2474-3	18SLB02-0405	9905519-01
WP2474-4	19SLB09-0405D	
WP2474-5	19SLB03-0506	
WP2474-6	19SLB09-0405	
WP2474-7	19SLB06-0506	
WP2474-8	19SLB08-0405	
WP2474-9	16SLB06-0304	9905519-05
WP2474-10	16SLB10-0304	
WP2474-11	16SLB03-0304	
WP2474-12	19SLB16-0203	
WP2474-13	16SLB04-0304	9905519-04
WP2474-14	02TL00201 TRIP BLANK	
WP2474-15	16SLB04-0304/2ND INT	
WP2474-16	16SLB04-0304/TPO INT	

The samples were logged in for the analyses specified on the chain of custody form. All problems encountered and resolved during sample receipt have been documented on the applicable chain of custody forms.

Sample analyses have been performed by the methods as noted herein.

Volatile Organic Analysis

One aqueous (trip blank) and thirteen soil/sediment samples were received by the Katahdin Analytical Services, Inc. GC/MS laboratory on May 15, 1999 and were specified to be analyzed by USEPA method 8260B for the analytes benzene, toluene, ethylbenzene, xylenes, MTBE, naphthalene, and EDB.

Katahdin
ANALYTICAL SERVICES

Analyses for this SDG were performed on instruments 5972-M (low level soil), 5972-F(aqueous/medium level soil), and 5970-Q (medium level soil). A VSTD050 (50 ppb standard) was used for the continuing calibration standard. Internal standard and surrogate compounds were also spiked at 50 ug/l.

Batch QC (VBLK, and LCS) was performed in each twelve hour window. Results are included in this data package. The LCS QC samples were spiked with the entire list of compounds quantitated for at 50 ppb. No matrix spike/matrix spike duplicate pair was analyzed on any of the samples in this workorder.

Method 8000B, section 7.5.1.2.1 (Revision 2, 12/96) states, "in those instances where the RSD for one or more analytes exceeds 20%, the initial calibration curve may still be acceptable if the mean of the RSD values for all analytes in the calibration is less than or equal to 20%." Method 8260B narrows this 20% maximum to 15%.

In the calibration curves analyzed in this SDG, several analytes had %RSD values exceeding the allowed 15%. Since the average %RSD for all analytes was 11.5%, 8.4%, 8.3%, 10.4%, and 13.4%, the curves were acceptable.

Sample WP2474-4 was analyzed following medium level protocols only due to the matrix, resulting in elevated reporting limits.

Initial analysis of sample WP2474-6 yielded internal standard area and surrogate recovery deviations. Reanalysis yielded similar results, confirming matrix interference. Both sets of data for this sample are included in this data package.

Initial analyses of samples WP2474-8 and -13 yielded surrogate recovery deviations and target analyte concentrations over the upper limit of the calibration curve. Reanalysis occurred following medium level protocols successfully. Both sets of data for each sample are included in this data package.

Initial analysis of sample WP2474-11 yielded potential carryover. Analysis of sample WP2474-12
yielded internal standard area recoveries. Reanalysis of each occurred following medium level protocols since none of the low level ENCORE aliquots remained.

Several manual integrations were performed due to split peaks; all have been flagged with a "M" (software-generated) on the pertinent quantitation reports. All "M" flags have been dated and initialed by the analyst performing the integration. In addition, all "M" flags have been reviewed and approved by the GC/MS supervisor. Copies of each manual integration are included in the pertinent quantitation reports.

No other protocol deviations were noted by the volatile organics staff.

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Tel: (603) 431-5777 Fax: (603) 436-3356

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ANALYTICAL SERVICES

Semivolatile Organic Analysis

Thirteen soil/sediment samples were received by the Katahdin GC/MS laboratory on May 15, 1999 for analysis in accordance with 8270C for the TCL/PAH list of analytes.

Extraction of all of the soil samples occurred following USEPA method 3550 on May 26, 1999. A laboratory control spike consisting of all TCL analytes spiked into organic free sand, was extracted in the batch along with a site specific MS/MSD pair on sample WP2474-9.

WP2474-9, 9MS and 9MSD showed an elevated recovery for the surrogate terphenyl-d14, and low recovery of the internal standard Perylene-d12 confirming matrix interference. No action was taken in accordance with the method.

Sample WP2474-2 was initially analyzed on 6/28/99 and displayed less than 50% recovery for the internal standard perylene-d12, and an elevated recovery for the surrogate terphenyl-d14. Reanalysis confirmed matrix interference as perylene-d12 recovered below 50% again, both sets of data are enclosed in the data package.

Sample WP2474-7 recovered the surrogate terphenyl-d14 above the limit, an elevated recovery would indicate a high bias and the sample showed no positive detects.

Sample WP2474-12 recovered the internal standards chrysene-d12, and perylene-d12 at less than 50%, reanalysis was not performed. The target analyte result for Benzo (ghi) Perylene may be biased high.

The initial calibration curves analyzed in this SDG had some of the target analyte %RSD values exceeding 15 %.

Method 8000B, section 7.5.1.2.1 (Revision 2, 12/96) states, "in those instances where the RSD for one or more analytes exceeds 20%, the initial calibration curve may still be acceptable if the mean of the RSD values for all analytes in the calibration is less than or equal to 20%." Section 7.3.7.1 of method 8270C (revision 3, 12/96) narrows this 20% maximum to 15%.

In the calibration curves analyzed for this workorder, the average %RSD for all analytes were as follows:

5970-X 6/27/99 9.4%

Several manual integrations were performed due to split peaks; all have been flagged with a "M" by the data system. All manual integrations have been dated and initialed by the responsible analyst. Copies of each manual integration are included in the data package. All manual integrations have been reviewed and approved by the GC/MS supervisor.

No other protocol deviations were noted by the semivolatiles organics staff.

Metals Analysis

The samples of Katahdin Work Order WP2474 were prepared and analyzed for metals in accordance with the "Test Methods for Evaluating Solid Waste", SW-846, November 1986, Third Edition.

Inductively-Coupled Plasma (ICP) Atomic Emission Spectroscopic Analysis

Solid-matrix Katahdin Sample Nos. WP2474-(1-3) were digested for ICP analysis on 06/14/99 (QC Batch PF14ICS0) in accordance with USEPA Method 3050B. The measured calcium concentration (0.111 mg/L, corresponding to a dry-weight concentration of 11.1 mg/kg) of the preparation blank (PBSPF14ICS0) that is associated with this digestion batch exceeds the laboratory's acceptance limit. However, because the measured calcium concentrations of all associated client samples are more than ten times that of the preparation blank, no corrective action is required.

ICP analyses of Katahdin Work Order WP2474 sample digestates were performed in accordance with USEPA Method 6010B, using a Thermo Jarrell Ash (TJA) Trace ICP spectrometer and a TJA 61 ICP spectrometer. All samples were analyzed within holding times and all QC criteria were met with the following comments or exceptions:

Some of the results for run QC samples (ICV, ICB, CCV, CCB, ICSA, and ICSAB) included in the accompanying data package may have exceeded acceptance limits for some elements. Please note that all client samples and batch QC samples associated with out-of-control results for run QC samples were subsequently reanalyzed for the analytes in question.

Analysis of Mercury by Cold Vapor Atomic Absorption (CVAA)

Solid-matrix Katahdin Sample Nos. WP2474-(1-3) were digested for mercury analysis on 06/09/99 (QC Batch PF09HGS2) in accordance with USEPA Method 7471A. Katahdin Sample No. WP2474-1 was prepared with duplicate matrix-spiked aliquots.

Mercury analyses of Katahdin Work Order WP2474 sample digestates were performed using a Leeman Labs PS200 automated mercury analyzer. All samples were analyzed within holding times and all run QC criteria were met.

Wet Chemistry Analysis

For work order WP2474 the analyses for Total Combustible Organics (TCO) have been performed in accordance with the "Annual Book of ASTM Standards", 1987. Analyses for Solids-Total Residue (TS) for work order WP2474 samples have been performed in accordance with "Contract Laboratory Program Statement of Work for Inorganic Analysis".

All analyses were performed within analytical hold time. No protocol deviations were noted by the Wet Chemistry laboratory staff.

Katahdin
ANALYTICAL SERVICES

I certify that this data package is in compliance with the terms and conditions of the contract, both technically and for completeness, for other than the conditions detailed above. Release of the data contained in this hardcopy data package has been authorized by the Laboratory Manager and/or his designee, as verified by the following signature.

Authorized Signature

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KATAH(ANALYTICAL SERVICES, INC.
SAMPLE RECEIPT CONDITION REPORT
Tel. (207) 874-2400
Fax (207) 775-4029

LAB (WORK ORDER) #: WP 2474

PAGE: 1 OF 2

COOLER: 1 OF 2

CLIENT: Tetra Tech

PROJECT: CNC Charleston

COC#: —
SDG#: —
DATE / TIME RECEIVED: 051599 1100
DELIVERED BY: FEDEX
RECEIVED BY: SR
LIMS ENTRY BY: BKR
LIMS REVIEW BY / PM: ADC

	YES	NO	EXCEPTIONS	COMMENTS	RESOLUTION
1. CUSTODY SEALS PRESENT / INTACT?	☑	☐	☐		
2. CHAIN OF CUSTODY PRESENT IN THIS COOLER?	☑	☐	☐		
3. CHAIN OF CUSTODY SIGNED BY CLIENT?	☑	☐	☐		
4. CHAIN OF CUSTODY MATCHES SAMPLES?	☑	☐	☐		
5. TEMPERATURE BLANKS PRESENT?	☑	☐	☐	TEMP BLANK TEMP (°C)= 2.9	
6. SAMPLES RECEIVED AT 4°C +/- 2? ICE / ICE PACKS PRESENT Y or N?	☑	☐	☐	COOLER TEMP (°C)= NA (RECORD COOLER TEMP ONLY IF TEMP BLANK IS NOT PRESENT)	
7. VOLATILES FREE OF HEADSPACE?	☑	☐	☐		
8. TRIP BLANK PRESENT IN THIS COOLER	☑	☐	☐		
9. PROPER SAMPLE CONTAINERS AND VOLUME?	☑	☐	☐		
10. SAMPLES WITHIN HOLD TIME UPON RECEIPT?	☑	☐	☐	VOA encores inadvertantly not extended within 48 hours	Lab extended on Monday 5/1 per Kelly Johnson-Carper & Dan Calligan
11. SAMPLES PROPERLY PRESERVED(1)?	☑	☐	☐		
12. CORRECTIVE ACTION REPORT FILED?	☐	☑	N/A		

13. ANALYTICAL PROGRAMS (CIRCLE ONE) COMMERCIAL CLP HAZWRAP NFESC ACOE AFCEE OTHER (STATE OF ORIGIN):

LOG - IN NOTES(1):

(1) Use this space (and additional sheets if necessary) to document samples that are received broken or compromised, C-O-C discrepancies, radiation checks, residual chlorine check, results of pH check if required. If samples required pH adjustment, record volume and type of preservative added.

000007

KATAHDIN ANALYTICAL SERVICES, INC.
SAMPLE RECEIPT CONDITION REPORT

Tel. (207) 874-2400
Fax (207) 775-4029

LAB (WORK ORDER) #: WP 2474

PAGE: 2 OF 2

COOLER: 2 OF 2

CLIENT: Tetra Tech

PROJECT: CNC Charleston

COC#: —
SDG#: —
DATE / TIME RECEIVED: 051599 1100
DELIVERED BY: FEDEX
RECEIVED BY: SR
LIMS ENTRY BY: BER
LIMS REVIEW BY / PM: AJC

	YES	NO	EXCEPTIONS	COMMENTS	RESOLUTION
1. CUSTODY SEALS PRESENT / INTACT?	☑	☐	☐		
2.CHAIN OF CUSTODY PRESENT IN THIS COOLER?	☑	☐	☐		
3. CHAIN OF CUSTODY SIGNED BY CLIENT?	☑	☐	☐		
4. CHAIN OF CUSTODY MATCHES SAMPLES?	☑	☐	☐		
5. TEMPERATURE BLANKS PRESENT?	☑	☐	☐	TEMP BLANK TEMP (°C)= 3.5	
6. SAMPLES RECEIVED AT 4°C +/- 2? ICE / ICE PACKS PRESENT Y or N?	☑	☐	☐	COOLER TEMP (°C)= NA (RECORD COOLER TEMP ONLY IF TEMP BLANK IS NOT PRESENT)	
7. VOLATILES FREE OF HEADSPACE?	☐	☐	☑	NA	
8. TRIP BLANK PRESENT IN THIS COOLER	☐	☐	☑	↓	
9. PROPER SAMPLE CONTAINERS AND VOLUME?	☑	☐	☐		
10. SAMPLES WITHIN HOLD TIME UPON RECEIPT?	☑	☐	☐		
11. SAMPLES PROPERLY PRESERVED(1)?	☑	☐	☐		
12. CORRECTIVE ACTION REPORT FILED?	☐	☑	N/A		

13. ANALYTICAL PROGRAMS (CIRCLE ONE) COMMERCIAL CLP HAZWRAP NFESC ACOE AFCEE OTHER (STATE OF ORIGIN):

LOG - IN NOTES(1):

(1) Use this space (and additional sheets if necessary) to document samples that are received broken or compromised, C-O-C discrepancies, radiation checks, residual chlorine check, results of pH check if required. If samples required pH adjustment, record volume and type of preservative added.

00000008

Katahdin ANALYTICAL SERVICES
340 County Road No. 5
P.O. Box 720
Westbrook, ME 04098
Tel: (207) 874-2400
Fax: (207) 775-4029

CHAIN of CUSTODY

PLEASE PRINT IN PEN

Client: Tetra Tech NUS
Contact: Bryn Howze
Phone #: (423) 483-9900
Fax #: ( )

Address: NH-21 Ave. H
City: North Charleston
State: SC
Zip Code: 29405

Purchase Order #:
Proj. Name / No.:
Katahdin Quote #:

Bill (if different than above):
Address:

Sampler (Print / Sign):
Copies To:

LAB USE ONLY
WORK ORDER #: WP2474 -
KATAHDIN PROJECT MANAGER:

REMARKS:

SHIPPING INFO: ☐ FED EX ☐ UPS ☐ CLIENT
AIRBILL NO:
TEMP°C ☐ TEMP BLANK ☐ INTACT ☐ NOT INTACT

ANALYSIS AND CONTAINER TYPE PRESERVATIVES

*	Sample Description	Date / Time coll'd	Matrix	No. of Cntrs.	PAHs + Napth 8270C	TAL metals 6010B	BTEX 8260B En-Core 9071A	Grain Size Hydrometer						FID headspace (ppm)
	18SLB05-0406	5/14/99/ 1122	S	6	X	X	X							0
	18SLB01-0203	5/14 /0955	S	6	X	X	X							0
	18SLB02-0405	5/14 /0945	S	6	X	X	X							4
	19SLB09-0405D	5/14/ 1140	S	5	X		X							700
	18SLB030506	5/14/0922	S	5	X		X							3
	19SLB09-0405	5/14/0835	S	5	X		X							700
	19SLB06-0506	5/14 /0907	S	5	X		X							6
	19SLB08-0405	5/14 /0850	S	5	X		X							>5000
	02TL00201 Trip Blank	5/13 / 1515	W	2			X							
	16SLB04-0304	5/14 / 1535	S	8	X	X	X	X						>3000
	16SLB06-0304	5/14 / 1450	S	5	X		X							2
	16SLB10-0304	5/14 / 1505	S	5	X		X							50
	16SLB03-0304	5/14 / 1545	S	5	X		X							110
	19SLB16-0203	5/14 / 1615	S	5	X		X							0
		/												
		/												

COMMENTS: metals cancelled on 16SLB04-0304 per Bryn Howze 5/17/99

Relinquished By: (Signature)	Date / Time	Received By: (Signature)	Relinquished By: (Signature)	Date / Time	Received By: (Signature)
[signature]	5/14/99 1134	Fed Ex 809214212857		05/17/99 0830	[signature]
Relinquished By: (Signature)	**Date / Time**	**Received By: (Signature)**	**Relinquished By: (Signature)**	**Date / Time**	**Received By: (Signature)**
FEDEX	5/15/99 1100	Steve Russo			

KATAHDIN ANALYTICAL SERVICES
REPORT OF ANALYTICAL RESULTS

Client:	Arnold Lamb	**Lab Number:**	WP2474-14
	Tetra Tech NUS	**SDG:**	WP2474
	1401 Oven Park Dr.	**Report Date:**	6/14/99
	Suite 102	**PO No. :**	N7912-P99264
	Tallahassee, FL 32308	**Project:**	CTO #68
Proj. ID:	CNC CHARLESTON	**% Solids:**	-
		Method:	SW8260
		Date Analyzed:	5/26/99

Sample Description	Matrix	Sampled Date	Rec'd Date	Ext. Date	Ext'd By	Ext. Method	Analyst
02TL00201 TRIP BLANK	SL	5/13/99	5/15/99	5/26/99	JSS	5030	JSS

Compound	Result	Units	DF	Sample PQL	Method PQL
BENZENE	<5	ug/Kgdrywt	1.0	5	5
TOLUENE	<5	ug/Kgdrywt	1.0	5	5
1,2-DIBROMOETHANE	<5	ug/Kgdrywt	1.0	5	5
ETHYLBENZENE	<5	ug/Kgdrywt	1.0	5	5
NAPHTHALENE	<5	ug/Kgdrywt	1.0	5	5
MTBE	<5	ug/Kgdrywt	1.0	5	5
TOTAL XYLENES	<5	ug/Kgdrywt	1.0	5	5
DIBROMOFLUOROMETHANE	81	%	1.0		
1,2-DICHLOROETHANE-D4	81	%	1.0		
TOLUENE-D8	87	%	1.0		
P-BROMOFLUOROBENZENE	81	%	1.0		

Report Notes:

KATAHDIN ANALYTICAL SERVICES
REPORT OF ANALYTICAL RESULTS

'ient:	Arnold Lamb	Lab Number:	WP2474-2
	Tetra Tech NUS	SDG:	WP2474
	1401 Oven Park Dr.	Report Date:	6/14/99
	Suite 102	PO No. :	N7912-P99264
	Tallahassee, FL 32308	Project:	CTO #68
Proj. ID:	CNC CHARLESTON	% Solids:	90
		Method:	SW8260
		Date Analyzed:	5/20/99

Sample Description	Matrix	Sampled Date	Rec'd Date	Ext. Date	Ext'd By	Ext. Method	Analyst
18SLB01-0203	SL	5/14/99	5/15/99	5/20/99	KMC	5030	KMC

Compound	Result	Units	DF	Sample PQL	Method PQL
BENZENE	<6	ug/Kg	1.1	6	5
TOLUENE	<6	ug/Kg	1.1	6	5
1,2-DIBROMOETHANE	<6	ug/Kg	1.1	6	5
ETHYLBENZENE	<6	ug/Kg	1.1	6	5
NAPHTHALENE	<6	ug/Kg	1.1	6	5
MTBE	<6	ug/Kg	1.1	6	5
TOTAL XYLENES	<6	ug/Kg	1.1	6	5
DIBROMOFLUOROMETHANE	89	%	1.1		
' 2-DICHLOROETHANE-D4	93	%	1.1		
)LUENE-D8	81	%	1.1		
P-BROMOFLUOROBENZENE	71	%	1.1		

Report Notes:

KATAHDIN ANALYTICAL SERVICES
REPORT OF ANALYTICAL RESULTS

Client:	Paul Calligan Tetra Tech NUS 1401 Oven Park Dr. Suite 102 Tallahassee, FL 32308	**Lab Number:**	WP2474-2
		SDG:	WP2474
		Report Date:	7/12/99
		PO No. :	N7912-P99264
		Project:	CTO #68
Proj. ID:	CNC CHARLESTON	**% Solids:**	90
		Method:	EPA 8270
		Date Analyzed:	6/28/99

Sample Description	Matrix	Sampled Date	Rec'd Date	Ext. Date	Ext'd By	Ext. Method	Analyst
18SLB01-0203	SL	5/14/99	5/15/99	5/26/99	DPD	EPA 3550	SW

Compound	Result	Units	DF	Sample PQL	Method PQL
NAPHTHALENE	<400	ug/Kg	1.2	400	330
2-METHYLNAPHTHALENE	<400	ug/Kg	1.2	400	330
ACENAPHTHYLENE	<400	ug/Kg	1.2	400	330
ACENAPHTHENE	<400	ug/Kg	1.2	400	330
FLUORENE	<400	ug/Kg	1.2	400	330
PHENANTHRENE	<400	ug/Kg	1.2	400	330
ANTHRACENE	<400	ug/Kg	1.2	400	330
FLUORANTHENE	<400	ug/Kg	1.2	400	330
PYRENE	<400	ug/Kg	1.2	400	330
BENZO[A]ANTHRACENE	<400	ug/Kg	1.2	400	330
CHRYSENE	<400	ug/Kg	1.2	400	330
BENZO[B]FLUORANTHENE	<400	ug/Kg	1.2	400	330
BENZO[K]FLUORANTHENE	<400	ug/Kg	1.2	400	330
BENZO[A]PYRENE	<400	ug/Kg	1.2	400	330
INDENO[1,2,3-CD]PYRENE	<400	ug/Kg	1.2	400	330
DIBENZ[A,H]ANTHRACENE	<400	ug/Kg	1.2	400	330
BENZO[G,H,I]PERYLENE	<400	ug/Kg	1.2	400	330
NITROBENZENE-D5	97	%	1.2		
2-FLUOROBIPHENYL	93	%	1.2		
TERPHENYL-D14	#163	%	1.2		

Report Notes: #, O-13

Katahdin ANALYTICAL SERVICES

KATAHDIN ANALYTICAL SERVICES
REPORT OF ANALYTICAL RESULTS

Client:	Paul Calligan Tetra Tech NUS 1401 Oven Park Dr. Suite 102 Tallahassee, FL 32308	**Lab Number:**	WP2474-2RA
		SDG:	WP2474
		Report Date:	7/12/99
		PO No. :	N7912-P99264
		Project:	CTO #68
Proj. ID:	CNC CHARLESTON	**% Solids:**	90
		Method:	EPA 8270
		Date Analyzed:	6/29/99

Sample Description	Matrix	Sampled Date	Rec'd Date	Ext. Date	Ext'd By	Ext. Method	Analyst
18SLB01-0203	SL	5/14/99	5/15/99	5/26/99	DPD	EPA 3550	KRT

Compound	Result	Units	DF	Sample PQL	Method PQL
NAPHTHALENE	<400	ug/Kg	1.2	400	330
2-METHYLNAPHTHALENE	<400	ug/Kg	1.2	400	330
ACENAPHTHYLENE	<400	ug/Kg	1.2	400	330
ACENAPHTHENE	<400	ug/Kg	1.2	400	330
FLUORENE	<400	ug/Kg	1.2	400	330
PHENANTHRENE	<400	ug/Kg	1.2	400	330
ANTHRACENE	<400	ug/Kg	1.2	400	330
FLUORANTHENE	<400	ug/Kg	1.2	400	330
PYRENE	<400	ug/Kg	1.2	400	330
BENZO[A]ANTHRACENE	<400	ug/Kg	1.2	400	330
CHRYSENE	<400	ug/Kg	1.2	400	330
BENZO[B]FLUORANTHENE	<400	ug/Kg	1.2	400	330
BENZO[K]FLUORANTHENE	<400	ug/Kg	1.2	400	330
BENZO[A]PYRENE	<400	ug/Kg	1.2	400	330
INDENO[1,2,3-CD]PYRENE	<400	ug/Kg	1.2	400	330
DIBENZ[A,H]ANTHRACENE	<400	ug/Kg	1.2	400	330
BENZO[G,H,I]PERYLENE	<400	ug/Kg	1.2	400	330
NITROBENZENE-D5	83	%	1.2		
2-FLUOROBIPHENYL	87	%	1.2		
TERPHENYL-D14	105	%	1.2		

Report Notes: O-13

INORGANIC ANALYSIS DATA SHEET

Lab Name: Katahdin Analytical Services | **Client Field ID:** 18SLB01-0203

Matrix: SOIL | **SDG Name:** WP2474

Percent Solids: 89.6 | **Lab Sample ID:** WP2474-002

Concentration Units (ug/L or mg/Kg dry weight): mg/Kg

CAS No.	Analyte	Concentration	C	Q	M	DF
7429-90-5	ALUMINUM	3410			P	1
7440-36-0	ANTIMONY	0.16	U		P	1
7440-38-2	ARSENIC	5.8			P	1
7440-39-3	BARIUM	11.0			P	1
7440-41-7	BERYLLIUM	0.37	B		P	1
7440-43-9	CADMIUM	0.35	B		P	1
7440-70-2	CALCIUM	11100			P	1
7440-47-3	CHROMIUM	10.4			P	1
7440-48-4	COBALT	1.5	B		P	1
7440-50-8	COPPER	15.3			P	1
7439-89-6	IRON	7160			P	1
7439-92-1	LEAD	16.1			P	1
7439-95-4	MAGNESIUM	882			P	1
7439-96-5	MANGANESE	56.8			P	1
7439-97-6	MERCURY	0.04		*	CV	1
7440-02-0	NICKEL	9.2			P	1
7440-09-7	POTASSIUM	454			P	1
7782-49-2	SELENIUM	0.56	B		P	1
7440-22-4	SILVER	0.22	U		P	1
7440-23-5	SODIUM	98.0			P	1
7440-28-0	THALLIUM	0.39	U		P	1
7440-62-2	VANADIUM	69.2			P	1
7440-66-6	ZINC	43.3			P	1

Color Before: BROWN | Texture: MEDIUM

Color After: YELLOW | Clarity After: CLEAR

Comments:

Client: Katahdin Analytical
340 County Road
Westbrook, Maine 04092
Contact: Ms. Andrea Colby
Project Description: Former Naval Complex

cc: KATA00199 Report Date: June 04, 1999

Sample ID	: 18SLB01-0203
Lab ID	: 9905519-02
Matrix	: Soil
Date Collected	: 05/14/99
Date Received	: 05/14/99
Priority	: Routine
Collector	: Client

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
General Chemistry											
Total Rec. Petro. Hydrocarbons		308	55.0	110	mg/kg	1.0	AAT	06/04/99	0830	150617	1
Evaporative Loss @ 105 C		9.00	1.00	1.00	wt%	1.0	GJ	05/18/99	1600	149376	2

M = Method	Method-Description
M 1	SW846 9071A
M 2	EPA 3550

Notes:
The qualifiers in this report are defined as follows:
ND indicates that the analyte was not detected at a concentration greater than the detection limit.
J indicates presence of analyte at a concentration less than the reporting limit (RL) and greater than the detection limit (DL).
U indicates that the analyte was not detected at a concentration greater than the detection limit.
* indicates that a quality control analyte recovery is outside of specified acceptance criteria.

Data reported in mass/mass units is reported as 'dry weight'.

This data report has been prepared and reviewed
in accordance with General Engineering Laboratories
standard operating procedures. Please direct
any questions to your Project Manager, Valerie Davis at (843) 769-7391.

Reviewed By

KATAHDIN ANALYTICAL SERVICES
REPORT OF ANALYTICAL RESULTS

Client:	Arnold Lamb Tetra Tech NUS 1401 Oven Park Dr. Suite 102 Tallahassee, FL 32308	**Lab Number:**	WP2474-3
		SDG:	WP2474
		Report Date:	6/14/99
		PO No. :	N7912-P99264
		Project:	CTO #68
Proj. ID:	CNC CHARLESTON	**% Solids:**	80
		Method:	SW8260
		Date Analyzed:	5/24/99

Sample Description	Matrix	Sampled Date	Rec'd Date	Ext. Date	Ext'd By	Ext. Method	Analyst
18SLB02-0405	SL	5/14/99	5/15/99	5/24/99	KMC	5030	KMC

Compound	Result	Units	DF	Sample PQL	Method PQL
BENZENE	<6	ug/Kg	1.2	6	5
TOLUENE	<6	ug/Kg	1.2	6	5
1,2-DIBROMOETHANE	<6	ug/Kg	1.2	6	5
ETHYLBENZENE	<6	ug/Kg	1.2	6	5
NAPHTHALENE	<6	ug/Kg	1.2	6	5
MTBE	<6	ug/Kg	1.2	6	5
TOTAL XYLENES	<6	ug/Kg	1.2	6	5
DIBROMOFLUOROMETHANE	95	%	1.2		
1,2-DICHLOROETHANE-D4	95	%	1.2		
TOLUENE-D8	87	%	1.2		
P-BROMOFLUOROBENZENE	77	%	1.2		

Report Notes:

KATAHDIN ANALYTICAL SERVICES
REPORT OF ANALYTICAL RESULTS

Client:	Paul Calligan Tetra Tech NUS 1401 Oven Park Dr. Suite 102 Tallahassee, FL 32308	Lab Number:	WP2474-3
		SDG:	WP2474
		Report Date:	7/12/99
		PO No. :	N7912-P99264
		Project:	CTO #68
Proj. ID:	CNC CHARLESTON	% Solids:	80
		Method:	EPA 8270
		Date Analyzed:	6/30/99

Sample Description	Matrix	Sampled Date	Rec'd Date	Ext. Date	Ext'd By	Ext. Method	Analyst
18SLB02-0405	SL	5/14/99	5/15/99	5/26/99	DPD	EPA 3550	KRT

Compound	Result	Units	DF	Sample PQL	Method PQL
NAPHTHALENE	<460	ug/Kg	1.4	460	330
2-METHYLNAPHTHALENE	<460	ug/Kg	1.4	460	330
ACENAPHTHYLENE	<460	ug/Kg	1.4	460	330
ACENAPHTHENE	<460	ug/Kg	1.4	460	330
FLUORENE	<460	ug/Kg	1.4	460	330
PHENANTHRENE	<460	ug/Kg	1.4	460	330
ANTHRACENE	<460	ug/Kg	1.4	460	330
FLUORANTHENE	<460	ug/Kg	1.4	460	330
PYRENE	<460	ug/Kg	1.4	460	330
BENZO[A]ANTHRACENE	<460	ug/Kg	1.4	460	330
CHRYSENE	<460	ug/Kg	1.4	460	330
BENZO[B]FLUORANTHENE	<460	ug/Kg	1.4	460	330
BENZO[K]FLUORANTHENE	<460	ug/Kg	1.4	460	330
BENZO[A]PYRENE	<460	ug/Kg	1.4	460	330
INDENO[1,2,3-CD]PYRENE	<460	ug/Kg	1.4	460	330
DIBENZ[A,H]ANTHRACENE	<460	ug/Kg	1.4	460	330
BENZO[G,H,I]PERYLENE	<460	ug/Kg	1.4	460	330
NITROBENZENE-D5	72	%	1.4		
2-FLUOROBIPHENYL	71	%	1.4		
TERPHENYL-D14	82	%	1.4		

Report Notes:

Client:	Katahdin Analytical 340 County Road Westbrook, Maine 04092
Contact:	Ms. Andrea Colby
Project Description:	Former Naval Complex

cc: KATA00199 Report Date: June 04, 1999

Sample ID	: 18SLB02-0405
Lab ID	: 9905519-01
Matrix	: Soil
Date Collected	: 05/14/99
Date Received	: 05/14/99
Priority	: Routine
Collector	: Client

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
General Chemistry											
Total Rec. Petro. Hydrocarbons		160	61.5	123	mg/kg	1.0	AAT	06/04/99	0830	150617	1
Evaporative Loss @ 105 C		19.0	1.00	1.00	wt%	1.0	GJ	05/18/99	1600	149376	2

M = Method	Method-Description
M 1	SW846 9071A
M 2	EPA 3550

Notes:
The qualifiers in this report are defined as follows:
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J indicates presence of analyte at a concentration less than the reporting limit (RL) and greater than the detection limit (DL).
U indicates that the analyte was not detected at a concentration greater than the detection limit.
* indicates that a quality control analyte recovery is outside of specified acceptance criteria.

Data reported in mass/mass units is reported as 'dry weight'.

This data report has been prepared and reviewed
in accordance with General Engineering Laboratories
standard operating procedures. Please direct
any questions to your Project Manager, Valerie Davis at (843) 769-7391.

Reviewed By

Katahdin
ANALYTICAL SERVICES

Lab Number	: WP-2474-2
Report Date:	07/13/99
PO No.	: N7912-P99264
Project	: CTO #68

CLIENT: Paul Calligan
Tetra Tech NUS
1401 Oven Park Dr., Suite 102
Tallahassee, FL 32308

WIC#: CNC CHARLESTON

REPORT OF ANALYTICAL RESULTS

SAMPLE DESCRIPTION	MATRIX	SAMPLED BY	SAMPLED DATE	RECEIVED
18SLB01-0203	Solid	CLIENT	05/14/99	05/15/99

PARAMETER	RESULT	UNITS	DF	*PQL	METHOD	ANALYZED	BY	NOTES
Solids-Total Residue (TS)	90.	wt %	1.0	0.10	CLP/CIP SOW	05/18/99	JF	1

* PQL (Practical Quantitation Level) represents laboratory reporting limits and may not reflect sample-specific reporting limits. Sample-specific limits are indicated by results annotated with '<' values.
(1) Sample Preparation on 05/17/99 by JF

07/13/99

LJO/baeajc(dw)/msm

CC: MS. LEE LECK
TETRA TECH NUS
FOSTER PLAZA 7
661 ANDERSEN DR.

INORGANIC ANALYSIS DATA SHEET

Lab Name: **Katahdin Analytical Services** **Client Field ID:** 18SLB02-0405

Matrix: SOIL **SDG Name:** WP2474

Percent Solids: 80.2 **Lab Sample ID:** WP2474-003

Concentration Units (ug/L or mg/Kg dry weight): mg/Kg

CAS No.	Analyte	Concentration	C	Q	M	DF
7429-90-5	ALUMINUM	1630			P	1
7440-36-0	ANTIMONY	0.14	U		P	1
7440-38-2	ARSENIC	1.5			P	1
7440-39-3	BARIUM	5.0			P	1
7440-41-7	BERYLLIUM	0.32	B		P	1
7440-43-9	CADMIUM	0.16	B		P	1
7440-70-2	CALCIUM	3380			P	1
7440-47-3	CHROMIUM	4.8			P	1
7440-48-4	COBALT	0.57	B		P	1
7440-50-8	COPPER	0.84	B		P	1
7439-89-6	IRON	2540			P	1
7439-92-1	LEAD	2.5			P	1
7439-95-4	MAGNESIUM	432			P	1
7439-96-5	MANGANESE	18.2			P	1
7439-97-6	MERCURY	0.02	B	*	CV	1
7440-02-0	NICKEL	1.04	U		P	1
7440-09-7	POTASSIUM	266			P	1
7782-49-2	SELENIUM	0.21	B		P	1
7440-22-4	SILVER	0.20	U		P	1
7440-23-5	SODIUM	128			P	1
7440-28-0	THALLIUM	0.35	U		P	1
7440-62-2	VANADIUM	5.5			P	1
7440-66-6	ZINC	6.0			P	1

Color Before: BROWN Texture: MEDIUM

Color After: YELLOW Clarity After: CLEAR

Comments:

Katahdin
ANALYTICAL SERVICES

CLIENT: Paul Calligan Tetra Tech NUS 1401 Oven Park Dr., Suite 102 Tallahassee, FL 32308	Lab Number : WP-2474-3 Report Date: 07/13/99 PO No. : N7912-P99264 Project : CTO #68

WIC#: CNC CHARLESTON

REPORT OF ANALYTICAL RESULTS

SAMPLE DESCRIPTION	MATRIX	SAMPLED BY	SAMPLED DATE	RECEIVED
18SLB02-0405	Solid	CLIENT	05/14/99	05/15/99

PARAMETER	RESULT	UNITS	DF	*PQL	METHOD	ANALYZED	BY	NOTES
Solids-Total Residue (TS)	80.	wt %	1.0	0.10	CLP/CIP SOW	05/18/99	JF	1

* PQL (Practical Quantitation Level) represents laboratory reporting limits and may not reflect sample-specific reporting limits. Sample-specific limits are indicated by results annotated with '<' values.
(1) Sample Preparation on 05/17/99 by JF

07/13/99

LJO/baeajc(dw)/msm

CC: MS. LEE LECK
TETRA TECH NUS
FOSTER PLAZA 7
661 ANDERSEN DR.

KATAHDIN ANALYTICAL SERVICES
REPORT OF ANALYTICAL RESULTS

Client:	Arnold Lamb Tetra Tech NUS 1401 Oven Park Dr. Suite 102 Tallahassee, FL 32308	**Lab Number:**	WP2474-1
		SDG:	WP2474
		Report Date:	6/14/99
		PO No. :	N7912-P99264
		Project:	CTO #68
Proj. ID:	CNC CHARLESTON	**% Solids:**	70
		Method:	SW8260
		Date Analyzed:	5/20/99

Sample Description	Matrix	Sampled Date	Rec'd Date	Ext. Date	Ext'd By	Ext. Method	Analyst
18SLB05-0406	SL	5/14/99	5/15/99	5/20/99	KMC	5030	KMC

Compound	Result	Units	DF	Sample PQL	Method PQL
BENZENE	<10	ug/Kg	2.1	10	5
TOLUENE	<10	ug/Kg	2.1	10	5
1,2-DIBROMOETHANE	<10	ug/Kg	2.1	10	5
ETHYLBENZENE	<10	ug/Kg	2.1	10	5
NAPHTHALENE	<10	ug/Kg	2.1	10	5
MTBE	<10	ug/Kg	2.1	10	5
TOTAL XYLENES	<10	ug/Kg	2.1	10	5
DIBROMOFLUOROMETHANE	90	%	2.1		
1,2-DICHLOROETHANE-D4	98	%	2.1		
TOLUENE-D8	81	%	2.1		
P-BROMOFLUOROBENZENE	78	%	2.1		

Report Notes:

KATAHDIN ANALYTICAL SERVICES
REPORT OF ANALYTICAL RESULTS

Client:	Paul Calligan	Lab Number:	WP2474-1
	Tetra Tech NUS	SDG:	WP2474
	1401 Oven Park Dr.	Report Date:	7/12/99
	Suite 102	PO No.:	N7912-P99264
	Tallahassee, FL 32308	Project:	CTO #68
Proj. ID:	CNC CHARLESTON	% Solids:	70
		Method:	EPA 8270
		Date Analyzed:	6/28/99

Sample Description	Matrix	Sampled Date	Rec'd Date	Ext. Date	Ext'd By	Ext. Method	Analyst
18SLB05-0406	SL	5/14/99	5/15/99	5/26/99	DPD	EPA 3550	SW

Compound	Result	Units	DF	Sample PQL	Method PQL
NAPHTHALENE	<530	ug/Kg	1.6	530	330
2-METHYLNAPHTHALENE	<530	ug/Kg	1.6	530	330
ACENAPHTHYLENE	<530	ug/Kg	1.6	530	330
ACENAPHTHENE	640	ug/Kg	1.6	530	330
FLUORENE	<530	ug/Kg	1.6	530	330
PHENANTHRENE	<530	ug/Kg	1.6	530	330
ANTHRACENE	<530	ug/Kg	1.6	530	330
FLUORANTHENE	<530	ug/Kg	1.6	530	330
PYRENE	<530	ug/Kg	1.6	530	330
ENZO[A]ANTHRACENE	<530	ug/Kg	1.6	530	330
HRYSENE	<530	ug/Kg	1.6	530	330
BENZO[B]FLUORANTHENE	<530	ug/Kg	1.6	530	330
BENZO[K]FLUORANTHENE	<530	ug/Kg	1.6	530	330
BENZO[A]PYRENE	<530	ug/Kg	1.6	530	330
INDENO[1,2,3-CD]PYRENE	<530	ug/Kg	1.6	530	330
DIBENZ[A,H]ANTHRACENE	<530	ug/Kg	1.6	530	330
BENZO[G,H,I]PERYLENE	<530	ug/Kg	1.6	530	330
NITROBENZENE-D5	56	%	1.6		
2-FLUOROBIPHENYL	67	%	1.6		
TERPHENYL-D14	84	%	1.6		

eport Notes:

Client:	Katahdin Analytical 340 County Road Westbrook, Maine 04092
Contact:	Ms. Andrea Colby
Project Description:	Former Naval Complex

cc: KATA00199 Report Date: June 04, 1999

Sample ID	: 18SLB05-0406
Lab ID	: 9905519-03
Matrix	: Soil
Date Collected	: 05/14/99
Date Received	: 05/14/99
Priority	: Routine
Collector	: Client

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
General Chemistry											
Total Rec. Petro. Hydrocarbons		370	66.0	132	mg/kg	1.0	AAT	06/04/99	0830	150617	1
Evaporative Loss @ 105 C		24.0	1.00	1.00	wt%	1.0	GJ	05/18/99	1600	149376	2

M = Method	Method-Description
M 1	SW846 9071A
M 2	EPA 3550

Notes:
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J indicates presence of analyte at a concentration less than the reporting limit (RL) and greater than the detection limit (DL).
U indicates that the analyte was not detected at a concentration greater than the detection limit.
* indicates that a quality control analyte recovery is outside of specified acceptance criteria.

Data reported in mass/mass units is reported as 'dry weight'.

This data report has been prepared and reviewed in accordance with General Engineering Laboratories standard operating procedures. Please direct any questions to your Project Manager, Valerie Davis at (843) 769-7391.

Reviewed By

INORGANIC ANALYSIS DATA SHEET

Lab Name: Katahdin Analytical Services
Client Field ID: 18SLB05-0406
Matrix: SOIL
SDG Name: WP2474
Percent Solids: 70.2
Lab Sample ID: WP2474-001

Concentration Units (ug/L or mg/Kg dry weight): mg/Kg

CAS No.	Analyte	Concentration	C	Q	M	DF
7429-90-5	ALUMINUM	4000			P	1
7440-36-0	ANTIMONY	0.18	U		P	1
7440-38-2	ARSENIC	5.0			P	1
7440-39-3	BARIUM	11.9			P	1
7440-41-7	BERYLLIUM	0.43	B		P	1
7440-43-9	CADMIUM	0.38	B		P	1
7440-70-2	CALCIUM	36800			P	1
7440-47-3	CHROMIUM	12.1			P	1
7440-48-4	COBALT	1.5	B		P	1
7440-50-8	COPPER	6.0			P	1
7439-89-6	IRON	6570			P	1
7439-92-1	LEAD	6.4			P	1
7439-95-4	MAGNESIUM	1750			P	1
7439-96-5	MANGANESE	72.8			P	1
7439-97-6	MERCURY	0.05		*	CV	1
7440-02-0	NICKEL	5.4			P	1
7440-09-7	POTASSIUM	547			P	1
7782-49-2	SELENIUM	0.38	B		P	1
7440-22-4	SILVER	0.25	U		P	1
7440-23-5	SODIUM	377			P	1
7440-28-0	THALLIUM	0.45	U		P	1
7440-62-2	VANADIUM	13.0			P	1
7440-66-6	ZINC	21.8			P	1

Color Before: BROWN
Texture: MEDIUM
Color After: YELLOW
Clarity After: CLEAR

Comments:

Katahdin
ANALYTICAL SERVICES

Lab Number	: WP-2474-1
Report Date:	07/13/99
PO No.	: N7912-P99264
Project	: CTO #68

CLIENT: Paul Calligan
Tetra Tech NUS
1401 Oven Park Dr., Suite 102
Tallahassee, FL 32308

WIC#: CNC CHARLESTON — REPORT OF ANALYTICAL RESULTS

SAMPLE DESCRIPTION	MATRIX	SAMPLED BY	SAMPLED DATE	RECEIVED
18SLB05-0406	Solid	CLIENT	05/14/99	05/15/99

PARAMETER	RESULT	UNITS	DF	*PQL	METHOD	ANALYZED	BY	NOTES
Solids-Total Residue (TS)	70.	wt %	1.0	0.10	CLP/CIP SOW	05/18/99	JF	1

* PQL (Practical Quantitation Level) represents laboratory reporting limits and may not reflect sample-specific reporting limits. Sample-specific limits are indicated by results annotated with '<' values.
(1) Sample Preparation on 05/17/99 by JF

07/13/99

LJO/baeajc(dw)/msm

CC: MS. LEE LECK
TETRA TECH NUS
FOSTER PLAZA 7
661 ANDERSEN DR.

KATAHDIN ANALYTICAL SERVICES
REPORT OF ANALYTICAL RESULTS

Client:	Arnold Lamb	**Lab Number:**	WP2474-4
	Tetra Tech NUS	**SDG:**	WP2474
	1401 Oven Park Dr.	**Report Date:**	6/14/99
	Suite 102	**PO No. :**	N7912-P99264
	Tallahassee, FL 32308	**Project:**	CTO #68
Proj. ID:	CNC CHARLESTON	**% Solids:**	74
		Method:	SW8260
		Date Analyzed:	5/24/99

Sample Description	Matrix	Sampled Date	Rec'd Date	Ext. Date	Ext'd By	Ext. Method	Analyst
19SLB09-0405D	SL	5/14/99	5/15/99	5/24/99	KRT	5030	KRT

Compound	Result	Units	DF	Sample PQL	Method PQL
BENZENE	<900	ug/Kgdrywt	180	900	5
TOLUENE	<900	ug/Kgdrywt	180	900	5
1,2-DIBROMOETHANE	<900	ug/Kgdrywt	180	900	5
ETHYLBENZENE	<900	ug/Kgdrywt	180	900	5
NAPHTHALENE	<900	ug/Kgdrywt	180	900	5
MTBE	<900	ug/Kgdrywt	180	900	5
TOTAL XYLENES	<900	ug/Kgdrywt	180	900	5
DIBROMOFLUOROMETHANE	98	%	180		
1,2-DICHLOROETHANE-D4	94	%	180		
)LUENE-D8	98	%	180		
-BROMOFLUOROBENZENE	94	%	180		

.eport Notes: O-1

KATAHDIN ANALYTICAL SERVICES
REPORT OF ANALYTICAL RESULTS

Client: Arnold Lamb
Tetra Tech NUS
1401 Oven Park Dr.
Suite 102
Tallahassee, FL 32308

Proj. ID: CNC CHARLESTON

Lab Number: WP2474-6
SDG: WP2474
Report Date: 6/14/99
PO No. : N7912-P99264
Project: CTO #68
% Solids: 73
Method: SW8260
Date Analyzed: 5/26/99

Sample Description	Matrix	Sampled Date	Rec'd Date	Ext. Date	Ext'd By	Ext. Method	Analyst
19SLB09-0405	SL	5/14/99	5/15/99	5/26/99	JSS	5030	JSS

Compound	Result	Units	DF	Sample PQL	Method PQL
BENZENE	<6	ug/Kg	1.2	6	5
TOLUENE	<6	ug/Kg	1.2	6	5
1,2-DIBROMOETHANE	<6	ug/Kg	1.2	6	5
ETHYLBENZENE	<6	ug/Kg	1.2	6	5
NAPHTHALENE	<6	ug/Kg	1.2	6	5
MTBE	<6	ug/Kg	1.2	6	5
TOTAL XYLENES	<6	ug/Kg	1.2	6	5
DIBROMOFLUOROMETHANE	$24	%	1.2		
1,2-DICHLOROETHANE-D4	$32	%	1.2		
TOLUENE-D8	$8	%	1.2		
P-BROMOFLUOROBENZENE	$4	%	1.2		

Report Notes: $, O-13

KATAHDIN ANALYTICAL SERVICES
REPORT OF ANALYTICAL RESULTS

Client:	Arnold Lamb Tetra Tech NUS 1401 Oven Park Dr. Suite 102 Tallahassee, FL 32308	**Lab Number:**	WP2474-6RE
		SDG:	WP2474
		Report Date:	6/14/99
		PO No. :	N7912-P99264
		Project:	CTO #68
Proj. ID:	CNC CHARLESTON	**% Solids:**	73
		Method:	SW8260
		Date Analyzed:	5/26/99

Sample Description	Matrix	Sampled Date	Rec'd Date	Ext. Date	Ext'd By	Ext. Method	Analyst
19SLB09-0405	SL	5/14/99	5/15/99	5/26/99	KMC	5030	KMC

Compound	Result	Units	DF	Sample PQL	Method PQL
BENZENE	<6	ug/Kg	1.2	6	5
TOLUENE	<6	ug/Kg	1.2	6	5
1,2-DIBROMOETHANE	<6	ug/Kg	1.2	6	5
ETHYLBENZENE	<6	ug/Kg	1.2	6	5
NAPHTHALENE	<6	ug/Kg	1.2	6	5
MTBE	<6	ug/Kg	1.2	6	5
TOTAL XYLENES	<6	ug/Kg	1.2	6	5
DIBROMOFLUOROMETHANE	$62	%	1.2		
1,2-DICHLOROETHANE-D4	86	%	1.2		
OLUENE-D8	$40	%	1.2		
P-BROMOFLUOROBENZENE	$52	%	1.2		

Report Notes: $, O1-3

KATAHDIN ANALYTICAL SERVICES
REPORT OF ANALYTICAL RESULTS

Client: Arnold Lamb
Tetra Tech NUS
1401 Oven Park Dr.
Suite 102
Tallahassee, FL 32308

Proj. ID: CNC CHARLESTON

Lab Number: WP2474-5
SDG: WP2474
Report Date: 6/14/99
PO No. : N7912-P99264
Project: CTO #68
% Solids: 69
Method: SW8260
Date Analyzed: 5/26/99

Sample Description	Matrix	Sampled Date	Rec'd Date	Ext. Date	Ext'd By	Ext. Method	Analyst
19SLB03-0506	SL	5/14/99	5/15/99	5/26/99	KMC	5030	KMC

Compound	Result	Units	DF	Sample PQL	Method PQL
BENZENE	<6	ug/Kg	1.3	6	5
TOLUENE	<6	ug/Kg	1.3	6	5
1,2-DIBROMOETHANE	<6	ug/Kg	1.3	6	5
ETHYLBENZENE	<6	ug/Kg	1.3	6	5
NAPHTHALENE	<6	ug/Kg	1.3	6	5
MTBE	<6	ug/Kg	1.3	6	5
TOTAL XYLENES	<6	ug/Kg	1.3	6	5
DIBROMOFLUOROMETHANE	122	%	1.3		
1,2-DICHLOROETHANE-D4	119	%	1.3		
TOLUENE-D8	122	%	1.3		
P-BROMOFLUOROBENZENE	104	%	1.3		

Report Notes:

KATAHDIN ANALYTICAL SERVICES
REPORT OF ANALYTICAL RESULTS

Client:	Arnold Lamb	Lab Number:	WP2474-7
	Tetra Tech NUS	SDG:	WP2474
	1401 Oven Park Dr.	Report Date:	6/14/99
	Suite 102	PO No. :	N7912-P99264
	Tallahassee, FL 32308	Project:	CTO #68
Proj. ID:	CNC CHARLESTON	% Solids:	83
		Method:	SW8260
		Date Analyzed:	5/26/99

Sample Description	Matrix	Sampled Date	Rec'd Date	Ext. Date	Ext'd By	Ext. Method	Analyst
19SLB06-0506	SL	5/14/99	5/15/99	5/26/99	JSS	5030	JSS

Compound	Result	Units	DF	Sample PQL	Method PQL
BENZENE	<6	ug/Kg	1.2	6	5
TOLUENE	<6	ug/Kg	1.2	6	5
1,2-DIBROMOETHANE	<6	ug/Kg	1.2	6	5
ETHYLBENZENE	<6	ug/Kg	1.2	6	5
NAPHTHALENE	<6	ug/Kg	1.2	6	5
MTBE	<6	ug/Kg	1.2	6	5
TOTAL XYLENES	<6	ug/Kg	1.2	6	5
DIBROMOFLUOROMETHANE	102	%	1.2		
1,2-DICHLOROETHANE-D4	105	%	1.2		
LUENE-D8	97	%	1.2		
. -BROMOFLUOROBENZENE	91	%	1.2		

.port Notes:

Katahdin ANALYTICAL SERVICES

KATAHDIN ANALYTICAL SERVICES
REPORT OF ANALYTICAL RESULTS

Client:	Arnold Lamb Tetra Tech NUS 1401 Oven Park Dr Suite 102 Tallahassee, FL 32308	**Lab Number:**	WP2474-8
		SDG:	WP2474
		Report Date:	6/14/99
		PO No. :	N7912-P99264
		Project:	CTO #68
Proj. ID:	CNC CHARLESTON	**% Solids:**	78
		Method:	SW8260
		Date Analyzed:	5/26/99

Sample Description	Matrix	Sampled Date	Rec'd Date	Ext. Date	Ext'd By	Ext. Method	Analyst
19SLB08-0405	SL	5/14/99	5/15/99	5/26/99	KMC	5030	KMC

Compound	Result	Units	DF	Sample PQL	Method PQL
BENZENE	<6	ug/Kg	1.2	6	5
TOLUENE	<6	ug/Kg	1.2	6	5
1,2-DIBROMOETHANE	<6	ug/Kg	1.2	6	5
ETHYLBENZENE	56	ug/Kg	1.2	6	5
NAPHTHALENE	E680	ug/Kg	1.2	6	5
MTBE	<6	ug/Kg	1.2	6	5
TOTAL XYLENES	92	ug/Kg	1.2	6	5
DIBROMOFLUOROMETHANE	112	%	1.2		
1,2-DICHLOROETHANE-D4	109	%	1.2		
TOLUENE-D8	107	%	1.2		
P-BROMOFLUOROBENZENE	#156	%	1.2		

Report Notes: E, #

KATAHDIN ANALYTICAL SERVICES
REPORT OF ANALYTICAL RESULTS

Client:	Amold Lamb	**Lab Number:**	WP2474-8DL
	Tetra Tech NUS	**SDG:**	WP2474
	1401 Oven Park Dr.	**Report Date:**	6/14/99
	Suite 102	**PO No. :**	N7912-P99264
	Tallahassee, FL 32308	**Project:**	CTO #68
Proj. ID:	CNC CHARLESTON	**% Solids:**	78
		Method:	SW8260
		Date Analyzed:	5/26/99

Sample Description	Matrix	Sampled Date	Rec'd Date	Ext. Date	Ext'd By	Ext. Method	Analyst
19SLB08-0405	SL	5/14/99	5/15/99	5/26/99	HMP	5035	HMP

Compound	Result	Units	DF	Sample PQL	Method PQL
BENZENE	<600	ug/Kgdrywt	120	600	5
TOLUENE	<600	ug/Kgdrywt	120	600	5
1,2-DIBROMOETHANE	<600	ug/Kgdrywt	120	600	5
ETHYLBENZENE	<600	ug/Kgdrywt	120	600	5
NAPHTHALENE	J450	ug/Kgdrywt	120	600	5
MTBE	<600	ug/Kgdrywt	120	600	5
TOTAL XYLENES	J340	ug/Kgdrywt	120	600	5
DIBROMOFLUOROMETHANE	96	%	120		
1,2-DICHLOROETHANE-D4	94	%	120		
)LUENE-D8	97	%	120		
. -BROMOFLUOROBENZENE	96	%	120		

port Notes: J, O-2

KATAHDIN ANALYTICAL SERVICES
REPORT OF ANALYTICAL RESULTS

Client:	Arnold Lamb Tetra Tech NUS 1401 Oven Park Dr. Suite 102 Tallahassee, FL 32308	**Lab Number:**	WP2474-12DL
		SDG:	WP2474
		Report Date:	6/14/99
		PO No. :	N7912-P99264
		Project:	CTO #68
Proj. ID:	CNC CHARLESTON	**% Solids:**	81
		Method:	SW8260
		Date Analyzed:	5/27/99

Sample Description	Matrix	Sampled Date	Rec'd Date	Ext. Date	Ext'd By	Ext. Method	Analyst
19SLB16-0203	SL	5/14/99	5/15/99	5/27/99	HMP	5035	HMP

Compound	Result	Units	DF	Sample PQL	Method PQL
BENZENE	<5	ug/Kgdrywt	1.0	5	5
TOLUENE	<5	ug/Kgdrywt	1.0	5	5
1,2-DIBROMOETHANE	<5	ug/Kgdrywt	1.0	5	5
ETHYLBENZENE	<5	ug/Kgdrywt	1.0	5	5
NAPHTHALENE	<5	ug/Kgdrywt	1.0	5	5
MTBE	<5	ug/Kgdrywt	1.0	5	5
TOTAL XYLENES	<5	ug/Kgdrywt	1.0	5	5
DIBROMOFLUOROMETHANE	93	%	1.0		
1,2-DICHLOROETHANE-D4	88	%	1.0		
TOLUENE-D8	92	%	1.0		
P-BROMOFLUOROBENZENE	98	%	1.0		

Report Notes:

KATAHDIN ANALYTICAL SERVICES
REPORT OF ANALYTICAL RESULTS

Client:	Arnold Lamb Tetra Tech NUS 1401 Oven Park Dr. Suite 102 Tallahassee, FL 32308	Lab Number:	WP2474-12
		SDG:	WP2474
		Report Date:	6/14/99
		PO No. :	N7912-P99264
		Project:	CTO #68
Proj. ID:	CNC CHARLESTON	% Solids:	81
		Method:	SW8260
		Date Analyzed:	5/26/99

Sample Description	Matrix	Sampled Date	Rec'd Date	Ext. Date	Ext'd By	Ext. Method	Analyst
19SLB16-0203	SL	5/14/99	5/15/99	5/26/99	KMC	5030	KMC

Compound	Result	Units	DF	Sample PQL	Method PQL
BENZENE	<7	ug/Kg	1.5	7	5
TOLUENE	<7	ug/Kg	1.5	7	5
1,2-DIBROMOETHANE	<7	ug/Kg	1.5	7	5
ETHYLBENZENE	<7	ug/Kg	1.5	7	5
NAPHTHALENE	J5	ug/Kg	1.5	7	5
MTBE	<7	ug/Kg	1.5	7	5
TOTAL XYLENES	<7	ug/Kg	1.5	7	5
DIBROMOFLUOROMETHANE	119	%	1.5		
1,2-DICHLOROETHANE-D4	116	%	1.5		
TOLUENE-D8	110	%	1.5		
P-BROMOFLUOROBENZENE	77	%	1.5		

Report Notes: J, O-13

KATAHDIN ANALYTICAL SERVICES
REPORT OF ANALYTICAL RESULTS

Client:	Paul Calligan Tetra Tech NUS 1401 Oven Park Dr. Suite 102 Tallahassee, FL 32308	**Lab Number:**	WP2474-4
		SDG:	WP2474
		Report Date:	7/12/99
		PO No. :	N7912-P99264
		Project:	CTO #68
Proj. ID:	CNC CHARLESTON	**% Solids:**	74
		Method:	EPA 8270
		Date Analyzed:	6/30/99

Sample Description	Matrix	Sampled Date	Rec'd Date	Ext. Date	Ext'd By	Ext. Method	Analyst
19SLB09-0405D	SL	5/14/99	5/15/99	5/26/99	DPD	EPA 3550	KRT

Compound	Result	Units	DF	Sample PQL	Method PQL
NAPHTHALENE	J380	ug/Kg	1.5	500	330
2-METHYLNAPHTHALENE	1500	ug/Kg	1.5	500	330
ACENAPHTHYLENE	<500	ug/Kg	1.5	500	330
ACENAPHTHENE	790	ug/Kg	1.5	500	330
FLUORENE	820	ug/Kg	1.5	500	330
PHENANTHRENE	750	ug/Kg	1.5	500	330
ANTHRACENE	J280	ug/Kg	1.5	500	330
FLUORANTHENE	560	ug/Kg	1.5	500	330
PYRENE	570	ug/Kg	1.5	500	330
BENZO[A]ANTHRACENE	<500	ug/Kg	1.5	500	330
CHRYSENE	J260	ug/Kg	1.5	500	330
BENZO[B]FLUORANTHENE	J300	ug/Kg	1.5	500	330
BENZO[K]FLUORANTHENE	<500	ug/Kg	1.5	500	330
BENZO[A]PYRENE	<500	ug/Kg	1.5	500	330
INDENO[1,2,3-CD]PYRENE	<500	ug/Kg	1.5	500	330
DIBENZ[A,H]ANTHRACENE	<500	ug/Kg	1.5	500	330
BENZO[G,H,I]PERYLENE	<500	ug/Kg	1.5	500	330
NITROBENZENE-D5	77	%	1.5		
2-FLUOROBIPHENYL	84	%	1.5		
TERPHENYL-D14	85	%	1.5		

Report Notes: J

Katahdin ANALYTICAL SERVICES

KATAHDIN ANALYTICAL SERVICES
REPORT OF ANALYTICAL RESULTS

Client:	Paul Calligan Tetra Tech NUS 1401 Oven Park Dr. Suite 102 Tallahassee, FL 32308	**Lab Number:**	WP2474-5
		SDG:	WP2474
		Report Date:	7/12/99
		PO No. :	N7912-P99264
		Project:	CTO #68
Proj. ID:	CNC CHARLESTON	**% Solids:**	69
		Method:	EPA 8270
		Date Analyzed:	6/30/99

Sample Description	Matrix	Sampled Date	Rec'd Date	Ext. Date	Ext'd By	Ext. Method	Analyst
19SLB03-0506	SL	5/14/99	5/15/99	5/26/99	DPD	EPA 3550	KRT

Compound	Result	Units	DF	Sample PQL	Method PQL
NAPHTHALENE	<530	ug/Kg	1.6	530	330
2-METHYLNAPHTHALENE	<530	ug/Kg	1.6	530	330
ACENAPHTHYLENE	<530	ug/Kg	1.6	530	330
ACENAPHTHENE	<530	ug/Kg	1.6	530	330
FLUORENE	<530	ug/Kg	1.6	530	330
PHENANTHRENE	<530	ug/Kg	1.6	530	330
ANTHRACENE	<530	ug/Kg	1.6	530	330
FLUORANTHENE	<530	ug/Kg	1.6	530	330
PYRENE	<530	ug/Kg	1.6	530	330
ENZO[A]ANTHRACENE	<530	ug/Kg	1.6	530	330
HRYSENE	<530	ug/Kg	1.6	530	330
BENZO[B]FLUORANTHENE	<530	ug/Kg	1.6	530	330
BENZO[K]FLUORANTHENE	<530	ug/Kg	1.6	530	330
BENZO[A]PYRENE	<530	ug/Kg	1.6	530	330
INDENO[1,2,3-CD]PYRENE	<530	ug/Kg	1.6	530	330
DIBENZ[A,H]ANTHRACENE	<530	ug/Kg	1.6	530	330
BENZO[G,H,I]PERYLENE	<530	ug/Kg	1.6	530	330
NITROBENZENE-D5	96	%	1.6		
2-FLUOROBIPHENYL	97	%	1.6		
TERPHENYL-D14	114	%	1.6		

eport Notes:

KATAHDIN ANALYTICAL SERVICES
REPORT OF ANALYTICAL RESULTS

Katahdin ANALYTICAL SERVICES

Client:	Paul Calligan Tetra Tech NUS 1401 Oven Park Dr. Suite 102 Tallahassee, FL 32308	**Lab Number:**	WP2474-6
		SDG:	WP2474
		Report Date:	7/12/99
		PO No. :	N7912-P99264
		Project:	CTO #68
Proj. ID:	CNC CHARLESTON	**% Solids:**	73
		Method:	EPA 8270
		Date Analyzed:	6/30/99

Sample Description	Matrix	Sampled Date	Rec'd Date	Ext. Date	Ext'd By	Ext. Method	Analyst
19SLB09-0405	SL	5/14/99	5/15/99	5/26/99	DPD	EPA 3550	KRT

Compound	Result	Units	DF	Sample PQL	Method PQL
NAPHTHALENE	J390	ug/Kg	1.5	500	330
2-METHYLNAPHTHALENE	660	ug/Kg	1.5	500	330
ACENAPHTHYLENE	<500	ug/Kg	1.5	500	330
ACENAPHTHENE	2600	ug/Kg	1.5	500	330
FLUORENE	720	ug/Kg	1.5	500	330
PHENANTHRENE	J370	ug/Kg	1.5	500	330
ANTHRACENE	<500	ug/Kg	1.5	500	330
FLUORANTHENE	<500	ug/Kg	1.5	500	330
PYRENE	<500	ug/Kg	1.5	500	330
BENZO[A]ANTHRACENE	<500	ug/Kg	1.5	500	330
CHRYSENE	<500	ug/Kg	1.5	500	330
BENZO[B]FLUORANTHENE	<500	ug/Kg	1.5	500	330
BENZO[K]FLUORANTHENE	<500	ug/Kg	1.5	500	330
BENZO[A]PYRENE	<500	ug/Kg	1.5	500	330
INDENO[1,2,3-CD]PYRENE	<500	ug/Kg	1.5	500	330
DIBENZ[A,H]ANTHRACENE	<500	ug/Kg	1.5	500	330
BENZO[G,H,I]PERYLENE	<500	ug/Kg	1.5	500	330
NITROBENZENE-D5	73	%	1.5		
2-FLUOROBIPHENYL	76	%	1.5		
TERPHENYL-D14	85	%	1.5		

Report Notes: J

KATAHDIN ANALYTICAL SERVICES
REPORT OF ANALYTICAL RESULTS

Client:	Paul Calligan	Lab Number:	WP2474-7
	Tetra Tech NUS	SDG:	WP2474
	1401 Oven Park Dr.	Report Date:	7/12/99
	Suite 102	PO No. :	N7912-P99264
	Tallahassee, FL 32308	Project:	CTO #68
Proj. ID:	CNC CHARLESTON	% Solids:	83
		Method:	EPA 8270
		Date Analyzed:	6/30/99

Sample Description	Matrix	Sampled Date	Rec'd Date	Ext. Date	Ext'd By	Ext. Method	Analyst
19SLB06-0506	SL	5/14/99	5/15/99	5/26/99	DPD	EPA 3550	KRT

Compound	Result	Units	DF	Sample PQL	Method PQL
NAPHTHALENE	<430	ug/Kg	1.3	430	330
2-METHYLNAPHTHALENE	<430	ug/Kg	1.3	430	330
ACENAPHTHYLENE	<430	ug/Kg	1.3	430	330
ACENAPHTHENE	<430	ug/Kg	1.3	430	330
FLUORENE	<430	ug/Kg	1.3	430	330
PHENANTHRENE	<430	ug/Kg	1.3	430	330
ANTHRACENE	<430	ug/Kg	1.3	430	330
FLUORANTHENE	<430	ug/Kg	1.3	430	330
PYRENE	<430	ug/Kg	1.3	430	330
BENZO[A]ANTHRACENE	<430	ug/Kg	1.3	430	330
CHRYSENE	<430	ug/Kg	1.3	430	330
BENZO[B]FLUORANTHENE	<430	ug/Kg	1.3	430	330
BENZO[K]FLUORANTHENE	<430	ug/Kg	1.3	430	330
BENZO[A]PYRENE	<430	ug/Kg	1.3	430	330
INDENO[1,2,3-CD]PYRENE	<430	ug/Kg	1.3	430	330
DIBENZ[A,H]ANTHRACENE	<430	ug/Kg	1.3	430	330
BENZO[G,H,I]PERYLENE	<430	ug/Kg	1.3	430	330
NITROBENZENE-D5	102	%	1.3		
2-FLUOROBIPHENYL	103	%	1.3		
TERPHENYL-D14	$138	%	1.3		

Report Notes: $

KATAHDIN ANALYTICAL SERVICES
REPORT OF ANALYTICAL RESULTS

Client:	Paul Calligan Tetra Tech NUS 1401 Oven Park Dr. Suite 102 Tallahassee, FL 32308	**Lab Number:**	WP2474-8
		SDG:	WP2474
		Report Date:	7/12/99
		PO No. :	N7912-P99264
		Project:	CTO #68
Proj. ID:	CNC CHARLESTON	**% Solids:**	78
		Method:	EPA 8270
		Date Analyzed:	6/30/99

Sample Description	Matrix	Sampled Date	Rec'd Date	Ext. Date	Ext'd By	Ext. Method	Analyst
19SLB08-0405	SL	5/14/99	5/15/99	5/26/99	DPD	EPA 3550	KRT

Compound	Result	Units	DF	Sample PQL	Method PQL
NAPHTHALENE	J3300	ug/Kg	14	4600	330
2-METHYLNAPHTHALENE	6800	ug/Kg	14	4600	330
ACENAPHTHYLENE	<4600	ug/Kg	14	4600	330
ACENAPHTHENE	4600	ug/Kg	14	4600	330
FLUORENE	7800	ug/Kg	14	4600	330
PHENANTHRENE	16000	ug/Kg	14	4600	330
ANTHRACENE	<4600	ug/Kg	14	4600	330
FLUORANTHENE	J3100	ug/Kg	14	4600	330
PYRENE	<4600	ug/Kg	14	4600	330
BENZO[A]ANTHRACENE	<4600	ug/Kg	14	4600	330
CHRYSENE	<4600	ug/Kg	14	4600	330
BENZO[B]FLUORANTHENE	<4600	ug/Kg	14	4600	330
BENZO[K]FLUORANTHENE	<4600	ug/Kg	14	4600	330
BENZO[A]PYRENE	<4600	ug/Kg	14	4600	330
INDENO[1,2,3-CD]PYRENE	<4600	ug/Kg	14	4600	330
DIBENZ[A,H]ANTHRACENE	<4600	ug/Kg	14	4600	330
BENZO[G,H,I]PERYLENE	<4600	ug/Kg	14	4600	330
NITROBENZENE-D5	82	%	14		
2-FLUOROBIPHENYL	79	%	14		
TERPHENYL-D14	76	%	14		

Report Notes: J, O-1

KATAHDIN ANALYTICAL SERVICES
REPORT OF ANALYTICAL RESULTS

Client:	Paul Calligan	Lab Number:	WP2474-12
	Tetra Tech NUS	SDG:	WP2474
	1401 Oven Park Dr.	Report Date:	7/12/99
	Suite 102	PO No. :	N7912-P99264
	Tallahassee, FL 32308	Project:	CTO #68
Proj. ID:	CNC CHARLESTON	% Solids:	81
		Method:	EPA 8270
		Date Analyzed:	6/30/99

Sample Description	Matrix	Sampled Date	Rec'd Date	Ext. Date	Ext'd By	Ext. Method	Analyst
19SLB16-0203	SL	5/14/99	5/15/99	5/26/99	DPD	EPA 3550	KRT

Compound	Result	Units	DF	Sample PQL	Method PQL
NAPHTHALENE	<460	ug/Kg	1.4	460	330
2-METHYLNAPHTHALENE	<460	ug/Kg	1.4	460	330
ACENAPHTHYLENE	<460	ug/Kg	1.4	460	330
ACENAPHTHENE	<460	ug/Kg	1.4	460	330
FLUORENE	<460	ug/Kg	1.4	460	330
PHENANTHRENE	<460	ug/Kg	1.4	460	330
ANTHRACENE	<460	ug/Kg	1.4	460	330
FLUORANTHENE	<460	ug/Kg	1.4	460	330
PYRENE	<460	ug/Kg	1.4	460	330
BENZO[A]ANTHRACENE	<460	ug/Kg	1.4	460	330
CHRYSENE	<460	ug/Kg	1.4	460	330
BENZO[B]FLUORANTHENE	<460	ug/Kg	1.4	460	330
BENZO[K]FLUORANTHENE	<460	ug/Kg	1.4	460	330
BENZO[A]PYRENE	<460	ug/Kg	1.4	460	330
INDENO[1,2,3-CD]PYRENE	<460	ug/Kg	1.4	460	330
DIBENZ[A,H]ANTHRACENE	<460	ug/Kg	1.4	460	330
BENZO[G,H,I]PERYLENE	J240	ug/Kg	1.4	460	330
NITROBENZENE-D5	52	%	1.4		
2-FLUOROBIPHENYL	55	%	1.4		
TERPHENYL-D14	50	%	1.4		

Report Notes: J,Last 2 I.S. areas are out of criteria due to the matrix

Katahdin
ANALYTICAL SERVICES

CLIENT: Paul Calligan Tetra Tech NUS 1401 Oven Park Dr., Suite 102 Tallahassee, FL 32308	Lab Number : WP-2474-4 Report Date: 07/13/99 PO No. : N7912-P99264 Project : CTO #68

WIC#: CNC CHARLESTON

REPORT OF ANALYTICAL RESULTS

SAMPLE DESCRIPTION	MATRIX	SAMPLED BY	SAMPLED DATE	RECEIVED
19SLB09-0405D	Solid	CLIENT	05/14/99	05/15/99

PARAMETER	RESULT	UNITS	DF	*PQL	METHOD	ANALYZED	BY	NOTES
Solids-Total Residue (TS)	74.	wt %	1.0	0.10	CLP/CIP SOW	05/18/99	JF	1

* PQL (Practical Quantitation Level) represents laboratory reporting limits and may not reflect sample-specific reporting limits. Sample-specific limits are indicated by results annotated with '<' values.
(1) Sample Preparation on 05/17/99 by JF

07/13/99

LJO/baeajc(dw)/msm

CC: MS. LEE LECK
TETRA TECH NUS
FOSTER PLAZA 7
661 ANDERSEN DR.

Katahdin
ANALYTICAL SERVICES

CLIENT: Paul Calligan
Tetra Tech NUS
1401 Oven Park Dr., Suite 102
Tallahassee, FL 32308

Lab Number : WP-2474-5
Report Date: 07/13/99
PO No. : N7912-P99264
Project : CTO #68

WIC#: CNC CHARLESTON

REPORT OF ANALYTICAL RESULTS

SAMPLE DESCRIPTION	MATRIX	SAMPLED BY	SAMPLED DATE	RECEIVED
19SLB03-0506	Solid	CLIENT	05/14/99	05/15/99

PARAMETER	RESULT	UNITS	DF	*PQL	METHOD	ANALYZED	BY	NOTES
Solids-Total Residue (TS)	69.	wt %	1.0	0.10	CLP/CIP SOW	05/18/99	JF	1

* PQL (Practical Quantitation Level) represents laboratory reporting limits and may not reflect sample-specific reporting limits. Sample-specific limits are indicated by results annotated with '<' values.
(1) Sample Preparation on 05/17/99 by JF

07/13/99

LJO/baeajc(dw)/msm

CC: MS. LEE LECK
TETRA TECH NUS
FOSTER PLAZA 7
661 ANDERSEN DR.

Katahdin
ANALYTICAL SERVICES

CLIENT: Paul Calligan Tetra Tech NUS 1401 Oven Park Dr., Suite 102 Tallahassee, FL 32308	Lab Number : WP-2474-6 Report Date: 07/13/99 PO No. : N7912-P99264 Project : CTO #68

WIC#: CNC CHARLESTON REPORT OF ANALYTICAL RESULTS

SAMPLE DESCRIPTION	MATRIX	SAMPLED BY	SAMPLED DATE	RECEIVED
19SLB09-0405	Solid	CLIENT	05/14/99	05/15/99

PARAMETER	RESULT	UNITS	DF	*PQL	METHOD	ANALYZED	BY	NOTES
Solids-Total Residue (TS)	73.	wt %	1.0	0.10	CLP/CIP SOW	05/18/99	JF	1

* PQL (Practical Quantitation Level) represents laboratory reporting limits and may not reflect sample-specific reporting limits. Sample-specific limits are indicated by results annotated with '<' values.
(1) Sample Preparation on 05/17/99 by JF

07/13/99

LJO/baeajc(dw)/msm

CC: MS. LEE LECK
TETRA TECH NUS
FOSTER PLAZA 7
661 ANDERSEN DR.

Katahdin ANALYTICAL SERVICES

CLIENT: Paul Calligan
Tetra Tech NUS
1401 Oven Park Dr., Suite 102
Tallahassee, FL 32308

Lab Number : WP-2474-7
Report Date: 07/13/99
PO No. : N7912-P99264
Project : CTO #68

WIC#: CNC CHARLESTON

REPORT OF ANALYTICAL RESULTS

SAMPLE DESCRIPTION	MATRIX	SAMPLED BY	SAMPLED DATE	RECEIVED
19SLB06-0506	Solid	CLIENT	05/14/99	05/15/99

PARAMETER	RESULT	UNITS	DF	*PQL	METHOD	ANALYZED	BY	NOTES
Solids-Total Residue (TS)	83.	wt %	1.0	0.10	CLP/CIP SOW	05/18/99	JF	1

* PQL (Practical Quantitation Level) represents laboratory reporting limits and may not reflect sample-specific reporting limits. Sample-specific limits are indicated by results annotated with '<' values.
(1) Sample Preparation on 05/17/99 by JF

07/13/99

LJO/baeajc(dw)/msm

CC: MS. LEE LECK
TETRA TECH NUS
FOSTER PLAZA 7
661 ANDERSEN DR.

Katahdin
ANALYTICAL SERVICES

CLIENT: Paul Calligan	Lab Number : WP-2474-8
Tetra Tech NUS	Report Date: 07/13/99
1401 Oven Park Dr., Suite 102	PO No. : N7912-P99264
Tallahassee, FL 32308	Project : CTO #68

WIC#: CNC CHARLESTON

REPORT OF ANALYTICAL RESULTS

SAMPLE DESCRIPTION	MATRIX	SAMPLED BY	SAMPLED DATE	RECEIVED
19SLB08-0405	Solid	CLIENT	05/14/99	05/15/99

PARAMETER	RESULT	UNITS	DF	*PQL	METHOD	ANALYZED	BY	NOTES
Solids-Total Residue (TS)	78.	wt %	1.0	0.10	CLP/CIP SOW	05/18/99	JF	1

* PQL (Practical Quantitation Level) represents laboratory reporting limits and may not reflect sample-specific reporting limits. Sample-specific limits are indicated by results annotated with '<' values.

(1) Sample Preparation on 05/17/99 by JF

07/13/99

LJO/baeajc(dw)/msm

CC: MS. LEE LECK
TETRA TECH NUS
FOSTER PLAZA 7
661 ANDERSEN DR.

Katahdin
ANALYTICAL SERVICES

CLIENT: Paul Calligan
Tetra Tech NUS
1401 Oven Park Dr., Suite 102
Tallahassee, FL 32308

Lab Number : WP-2474-12
Report Date: 07/13/99
PO No. : N7912-P99264
Project : CTO #68

WIC#: CNC CHARLESTON

REPORT OF ANALYTICAL RESULTS

SAMPLE DESCRIPTION	MATRIX	SAMPLED BY	SAMPLED DATE	RECEIVED
19SLB16-0203	Solid	CLIENT	05/14/99	05/15/99

PARAMETER	RESULT	UNITS	DF	*PQL	METHOD	ANALYZED	BY	NOTES
Solids-Total Residue (TS)	81.	wt %	1.0	0.10	CLP/CIP SOW	05/18/99	JF	1

* PQL (Practical Quantitation Level) represents laboratory reporting limits and may not reflect sample-specific reporting limits. Sample-specific limits are indicated by results annotated with '<' values.
(1) Sample Preparation on 05/17/99 by JF

07/13/99

LJO/baeajc(dw)/msm

CC: MS. LEE LECK
TETRA TECH NUS
FOSTER PLAZA 7
661 ANDERSEN DR.

Katahdin
ANALYTICAL SERVICES

CLIENT: Paul Calligan
Tetra Tech NUS
1401 Oven Park Dr., Suite 102
Tallahassee, FL 32308

Lab Number : WP-2490-18
Report Date: 07/09/99
PO No. : N7912-P99264
Project : CTO #68

WIC#: CNC CHARLESTON

REPORT OF ANALYTICAL RESULTS

SAMPLE DESCRIPTION	MATRIX	SAMPLED BY	SAMPLED DATE	RECEIVED
19SLB16-0203	Solid	CLIENT	05/17/99	05/18/99

PARAMETER	RESULT	UNITS	DF	*PQL	METHOD	ANALYZED	BY	NOTES
Total Combustible Organics	4.3	wt %	1.0	0.1	ASTM D2974-8	06/08/99	JF	1

* PQL (Practical Quantitation Level) represents laboratory reporting limits and may not reflect sample-specific reporting limits. Sample-specific limits are indicated by results annotated with '<' values.
(1) Sample Preparation on 06/07/99 by JF

07/09/99

LJO/baeajc(dw)/msm
PF07TOS1
CC: MS. LEE LECK
TETRA TECH NUS
FOSTER PALZA 7
661 ANDERSEN DR.

KATAHDIN ANALYTICAL SERVICES
REPORT OF ANALYTICAL RESULTS

[illegible]nt:	Paul Calligan Tetra Tech NUS 1401 Oven Park Dr. Suite 102 Tallahassee, FL 32308	Lab Number:	WP2490-19
		SDG:	WP2490
		Report Date:	6/16/99
		PO No. :	N7912-P99264
		Project:	CTO #68
Proj. ID:	CNC CHARLESTON	% Solids:	N/A
		Method:	SW8260
		Date Analyzed:	5/26/99

Sample Description	Matrix	Sampled Date	Rec'd Date	Ext. Date	Ext'd By	Ext. Method	Analyst
01TL00103 (trip)	AQ	5/3/99	5/18/99	5/26/99	JSS	5030	JSS

Compound	Result	Units	DF	Sample PQL	Method PQL
BENZENE	<5	ug/L	1.0	5	5
TOLUENE	<5	ug/L	1.0	5	5
1,2-DIBROMOETHANE	<5	ug/L	1.0	5	5
ETHYLBENZENE	<5	ug/L	1.0	5	5
NAPHTHALENE	<5	ug/L	1.0	5	5
MTBE	<5	ug/L	1.0	5	5
TOTAL XYLENES	<5	ug/L	1.0	5	5
DIBROMOFLUOROMETHANE	83	%	1.0		
[illegible]DICHLOROETHANE-D4	80	%	1.0		
[illegible]JENE-D8	86	%	1.0		
P-BROMOFLUOROBENZENE	81	%	1.0		

Report Notes:

Client:	Katahdin Analytical 340 County Road Westbrook, Maine 04092
Contact:	Ms. Andrea Colby
Project Description:	Former Naval Complex

cc: KATA00199 Report Date: June 11, 1999

Sample ID	: 19SLB16-0203
Lab ID	: 9905606-03
Matrix	: Soil
Date Collected	: 05/17/99
Date Received	: 05/18/99
Priority	: Routine
Collector	: Client

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
General Chemistry											
Evaporative Loss @ 105 C		20.0	1.00	1.00	wt%	1.0	GJ	05/19/99	1540	149550	1
Total Organic Carbon		13900	254	590	mg/kg	1.0	LS	05/28/99	1220	150121	2

M = Method	Method-Description
M 1	EPA 3550
M 2	SW846 9060 Modified

Notes:
The qualifiers in this report are defined as follows:
ND indicates that the analyte was not detected at a concentration greater than the detection limit.
J indicates presence of analyte at a concentration less than the reporting limit (RL) and greater than the detection limit (DL).
U indicates that the analyte was not detected at a concentration greater than the detection limit.
* indicates that a quality control analyte recovery is outside of specified acceptance criteria.

Data reported in mass/mass units is reported as 'dry weight'.

This data report has been prepared and reviewed
in accordance with General Engineering Laboratories
standard operating procedures. Please direct
any questions to your Project Manager, Valerie Davis at (843) 769-7391.

KATAHDIN ANALYTICAL SERVICES
REPORT OF ANALYTICAL RESULTS

'ent:	Arnold Lamb	Lab Number:	WP2300-1
	Tetra Tech NUS	SDG:	WP2300
	794 South Military Trail	Report Date:	6/9/99
		PO No. :	N7912-P99264
	Deerfield Beach, FL 33442	Project:	CTO #68
Proj. ID:	CNC CHARLESTON	% Solids:	-
		Method:	SW8260
		Date Analyzed:	5/14/99

Sample Description	Matrix	Sampled Date	Rec'd Date	Ext. Date	Ext'd By	Ext. Method	Analyst
19TL00101	SL	5/3/99	5/5/99	5/14/99	KRT	5030	KRT

Compound	Result	Units	DF	Sample PQL	Method PQL
BENZENE	<5	ug/L	1.0	5	5
TOLUENE	<5	ug/L	1.0	5	5
1,2-DIBROMOETHANE	<5	ug/L	1.0	5	5
ETHYLBENZENE	<5	ug/L	1.0	5	5
NAPHTHALENE	<5	ug/L	1.0	5	5
MTBE	<5	ug/L	1.0	5	5
TOTAL XYLENES	<5	ug/L	1.0	5	5
DIBROMOFLUOROMETHANE	104	%	1.0		
?-DICHLOROETHANE-D4	109	%	1.0		
OLUENE-D8	97	%	1.0		
P-BROMOFLUOROBENZENE	98	%	1.0		

Report Notes:

KATAHDIN ANALYTICAL SERVICES
REPORT OF ANALYTICAL RESULTS

Client:	Arnold Lamb Tetra Tech NUS 794 South Military Trail Deerfield Beach, FL 33442	**Lab Number:**	WP2300-2
		SDG:	WP2300
		Report Date:	6/9/99
		PO No. :	N7912-P99264
		Project:	CTO #68
Proj. ID:	CNC CHARLESTON	**% Solids:**	82
		Method:	SW8260
		Date Analyzed:	5/13/99

Sample Description	Matrix	Sampled Date	Rec'd Date	Ext. Date	Ext'd By	Ext. Method	Analyst
19SLB11-0405	SL	5/4/99	5/5/99	5/13/99	KMC	5035	KMC

Compound	Result	Units	DF	Sample PQL	Method PQL
BENZENE	<6	ug/Kg	1.3	6	5
TOLUENE	<6	ug/Kg	1.3	6	5
1,2-DIBROMOETHANE	<6	ug/Kg	1.3	6	5
ETHYLBENZENE	<6	ug/Kg	1.3	6	5
NAPHTHALENE	E810	ug/Kg	1.3	6	5
MTBE	<6	ug/Kg	1.3	6	5
TOTAL XYLENES	J6	ug/Kg	1.3	6	5
DIBROMOFLUOROMETHANE	110	%	1.3		
1,2-DICHLOROETHANE-D4	100	%	1.3		
TOLUENE-D8	92	%	1.3		
P-BROMOFLUOROBENZENE	102	%	1.3		

Report Notes: J, E

KATAHDIN ANALYTICAL SERVICES
REPORT OF ANALYTICAL RESULTS

Client: Arnold Lamb
Tetra Tech NUS
794 South Military Trail

Deerfield Beach, FL 33442

Proj. ID: CNC CHARLESTON

Lab Number: WP2300-2RA
SDG: WP2300
Report Date: 6/9/99
PO No. : N7912-P99264
Project: CTO #68
% Solids: 82
Method: SW8260
Date Analyzed: 5/15/99

Sample Description	Matrix	Sampled Date	Rec'd Date	Ext. Date	Ext'd By	Ext. Method	Analyst
19SLB11-0405	SL	5/4/99	5/5/99	5/15/99	JSS	5030	JSS

Compound	Result	Units	DF	Sample PQL	Method PQL
BENZENE	<550	ug/L	110	550	5
TOLUENE	<550	ug/L	110	550	5
1,2-DIBROMOETHANE	<550	ug/L	110	550	5
ETHYLBENZENE	<550	ug/L	110	550	5
NAPHTHALENE	J200	ug/L	110	550	5
MTBE	<550	ug/L	110	550	5
TOTAL XYLENES	<550	ug/L	110	550	5
DIBROMOFLUOROMETHANE	99	%	110		
1,2-DICHLOROETHANE-D4	95	%	110		
LUENE-D8	98	%	110		
P-BROMOFLUOROBENZENE	91	%	110		

port Notes:

KATAHDIN ANALYTICAL SERVICES
REPORT OF ANALYTICAL RESULTS

Client:	Arnold Lamb Tetra Tech NUS 794 South Military Trail Deerfield Beach, FL 33442	**Lab Number:**	WP2300-5
		SDG:	WP2300
		Report Date:	6/9/99
		PO No. :	N7912-P99264
		Project:	CTO #68
Proj. ID:	CNC CHARLESTON	**% Solids:**	60
		Method:	SW8260
		Date Analyzed:	5/14/99

Sample Description	Matrix	Sampled Date	Rec'd Date	Ext. Date	Ext'd By	Ext. Method	Analyst
19SLB10-0405	SL	5/4/99	5/5/99	5/14/99	KRT	5030	KRT

Compound	Result	Units	DF	Sample PQL	Method PQL
BENZENE	<850	ug/L	170	850	5
TOLUENE	<850	ug/L	170	850	5
1,2-DIBROMOETHANE	<850	ug/L	170	850	5
ETHYLBENZENE	<850	ug/L	170	850	5
NAPHTHALENE	1600	ug/L	170	850	5
MTBE	<850	ug/L	170	850	5
TOTAL XYLENES	<850	ug/L	170	850	5
DIBROMOFLUOROMETHANE	100	%	170		
1,2-DICHLOROETHANE-D4	107	%	170		
TOLUENE-D8	99	%	170		
P-BROMOFLUOROBENZENE	107	%	170		

Report Notes:

KATAHDIN ANALYTICAL SERVICES
REPORT OF ANALYTICAL RESULTS

:	Paul Calligan Tetra Tech NUS 1401 Oven Park Dr. Suite 102 Tallahassee, FL 32308	**Lab Number:** **SDG:** **Report Date:** **PO No. :** **Project:**	WP2300-2 WP2300 6/30/99 N7912-P99264 CTO #68
Proj. ID:	CNC CHARLESTON	**% Solids:**	82
		Method:	EPA 8270
		Date Analyzed:	6/24/99

Sample Description	Matrix	Sampled Date	Rec'd Date	Ext. Date	Ext'd By	Ext. Method	Analyst
19SLB11-0405	SL	5/4/99	5/5/99	5/18/99	GST	SW3550	SW

Compound	Result	Units	DF	Sample PQL	Method PQL
NAPHTHALENE	J380	ug/Kg	1.2	400	330
2-METHYLNAPHTHALENE	930	ug/Kg	1.2	400	330
ACENAPHTHYLENE	<400	ug/Kg	1.2	400	330
ACENAPHTHENE	J270	ug/Kg	1.2	400	330
FLUORENE	J220	ug/Kg	1.2	400	330
PHENANTHRENE	660	ug/Kg	1.2	400	330
ANTHRACENE	<400	ug/Kg	1.2	400	330
FLUORANTHENE	<400	ug/Kg	1.2	400	330
[illegible]NE	560	ug/Kg	1.2	400	330
BENZO[A]ANTHRACENE	<400	ug/Kg	1.2	400	330
CHRYSENE	<400	ug/Kg	1.2	400	330
BENZO[B]FLUORANTHENE	<400	ug/Kg	1.2	400	330
BENZO[K]FLUORANTHENE	<400	ug/Kg	1.2	400	330
BENZO[A]PYRENE	<400	ug/Kg	1.2	400	330
INDENO[1,2,3-CD]PYRENE	<400	ug/Kg	1.2	400	330
DIBENZ[A,H]ANTHRACENE	<400	ug/Kg	1.2	400	330
BENZO[G,H,I]PERYLENE	<400	ug/Kg	1.2	400	330
NITROBENZENE-D5	80	%	1.2		
2-FLUOROBIPHENYL	84	%	1.2		
TERPHENYL-D14	93	%	1.2		

Report Notes: J, O-13

KATAHDIN ANALYTICAL SERVICES
REPORT OF ANALYTICAL RESULTS

Client:	Paul Calligan Tetra Tech NUS 1401 Oven Park Dr. Suite 102 Tallahassee, FL 32308	**Lab Number:**	WP2300-2RA
		SDG:	WP2300
		Report Date:	6/30/99
		PO No. :	N7912-P99264
		Project:	CTO #68
Proj. ID:	CNC CHARLESTON	**% Solids:**	82
		Method:	EPA 8270
		Date Analyzed:	6/25/99

Sample Description	Matrix	Sampled Date	Rec'd Date	Ext. Date	Ext'd By	Ext. Method	Analyst
19SLB11-0405	SL	5/4/99	5/5/99	5/18/99	GST	SW3550	SW

Compound	Result	Units	DF	Sample PQL	Method PQL
NAPHTHALENE	J260	ug/Kg	1.2	400	330
2-METHYLNAPHTHALENE	720	ug/Kg	1.2	400	330
ACENAPHTHYLENE	<400	ug/Kg	1.2	400	330
ACENAPHTHENE	<400	ug/Kg	1.2	400	330
FLUORENE	<400	ug/Kg	1.2	400	330
PHENANTHRENE	520	ug/Kg	1.2	400	330
ANTHRACENE	<400	ug/Kg	1.2	400	330
FLUORANTHENE	<400	ug/Kg	1.2	400	330
PYRENE	J350	ug/Kg	1.2	400	330
BENZO[A]ANTHRACENE	<400	ug/Kg	1.2	400	330
CHRYSENE	<400	ug/Kg	1.2	400	330
BENZO[B]FLUORANTHENE	<400	ug/Kg	1.2	400	330
BENZO[K]FLUORANTHENE	<400	ug/Kg	1.2	400	330
BENZO[A]PYRENE	<400	ug/Kg	1.2	400	330
INDENO[1,2,3-CD]PYRENE	<400	ug/Kg	1.2	400	330
DIBENZ[A,H]ANTHRACENE	<400	ug/Kg	1.2	400	330
BENZO[G,H,I]PERYLENE	<400	ug/Kg	1.2	400	330
NITROBENZENE-D5	67	%	1.2		
2-FLUOROBIPHENYL	75	%	1.2		
TERPHENYL-D14	76	%	1.2		

Report Notes: J, O-13

KATAHDIN ANALYTICAL SERVICES
REPORT OF ANALYTICAL RESULTS

nt: Paul Calligan
Tetra Tech NUS
1401 Oven Park Dr.
Suite 102
Tallahassee, FL 32308

Proj. ID: CNC CHARLESTON

Lab Number: WP2300-5
SDG: WP2300
Report Date: 6/30/99
PO No.: N7912-P99264
Project: CTO #68
% Solids: 60
Method: EPA 8270
Date Analyzed: 6/24/99

Sample Description	Matrix	Sampled Date	Rec'd Date	Ext. Date	Ext'd By	Ext. Method	Analyst
19SLB10-0405	SL	5/4/99	5/5/99	5/18/99	GST	SW3550	SW

Compound	Result	Units	DF	Sample PQL	Method PQL
NAPHTHALENE	1100	ug/Kg	1.6	530	330
2-METHYLNAPHTHALENE	3900	ug/Kg	1.6	530	330
ACENAPHTHYLENE	<530	ug/Kg	1.6	530	330
ACENAPHTHENE	<530	ug/Kg	1.6	530	330
FLUORENE	1700	ug/Kg	1.6	530	330
PHENANTHRENE	1800	ug/Kg	1.6	530	330
ANTHRACENE	<530	ug/Kg	1.6	530	330
FLUORANTHENE	J320	ug/Kg	1.6	530	330
ENE	560	ug/Kg	1.6	530	330
ZO[A]ANTHRACENE	<530	ug/Kg	1.6	530	330
CHRYSENE	<530	ug/Kg	1.6	530	330
BENZO[B]FLUORANTHENE	<530	ug/Kg	1.6	530	330
BENZO[K]FLUORANTHENE	<530	ug/Kg	1.6	530	330
BENZO[A]PYRENE	<530	ug/Kg	1.6	530	330
INDENO[1,2,3-CD]PYRENE	<530	ug/Kg	1.6	530	330
DIBENZ[A,H]ANTHRACENE	<530	ug/Kg	1.6	530	330
BENZO[G,H,I]PERYLENE	<530	ug/Kg	1.6	530	330
NITROBENZENE-D5	#124	%	1.6		
2-FLUOROBIPHENYL	#109	%	1.6		
TERPHENYL-D14	106	%	1.6		

Report Notes: J, #, O-13

KATAHDIN ANALYTICAL SERVICES
REPORT OF ANALYTICAL RESULTS

Client: Paul Calligan
Tetra Tech NUS
1401 Oven Park Dr.
Suite 102
Tallahassee, FL 32308

Proj. ID: CNC CHARLESTON

Lab Number: WP2300-5RA
SDG: WP2300
Report Date: 6/30/99
PO No. : N7912-P99264
Project: CTO #68
% Solids: 60
Method: EPA 8270
Date Analyzed: 6/25/99

Sample Description	Matrix	Sampled Date	Rec'd Date	Ext. Date	Ext'd By	Ext. Method	Analyst
19SLB10-0405	SL	5/4/99	5/5/99	5/18/99	GST	SW3550	SW

Compound	Result	Units	DF	Sample PQL	Method PQL
NAPHTHALENE	930	ug/Kg	1.6	530	330
2-METHYLNAPHTHALENE	2800	ug/Kg	1.6	530	330
ACENAPHTHYLENE	<530	ug/Kg	1.6	530	330
ACENAPHTHENE	J390	ug/Kg	1.6	530	330
FLUORENE	1200	ug/Kg	1.6	530	330
PHENANTHRENE	1400	ug/Kg	1.6	530	330
ANTHRACENE	<530	ug/Kg	1.6	530	330
FLUORANTHENE	<530	ug/Kg	1.6	530	330
PYRENE	J440	ug/Kg	1.6	530	330
BENZO[A]ANTHRACENE	<530	ug/Kg	1.6	530	330
CHRYSENE	<530	ug/Kg	1.6	530	330
BENZO[B]FLUORANTHENE	<530	ug/Kg	1.6	530	330
BENZO[K]FLUORANTHENE	<530	ug/Kg	1.6	530	330
BENZO[A]PYRENE	<530	ug/Kg	1.6	530	330
INDENO[1,2,3-CD]PYRENE	<530	ug/Kg	1.6	530	330
DIBENZ[A,H]ANTHRACENE	<530	ug/Kg	1.6	530	330
BENZO[G,H,I]PERYLENE	<530	ug/Kg	1.6	530	330
NITROBENZENE-D5	97	%	1.6		
2-FLUOROBIPHENYL	82	%	1.6		
TERPHENYL-D14	69	%	1.6		

Report Notes: J, O-13

INORGANIC ANALYSIS DATA SHEET

Lab Name: Katahdin Analytical Services
Client Field ID: 19SLB11-0405
Matrix: SOIL
SDG Name: WP2300
Percent Solids: 81.9
Lab Sample ID: WP2300-002

Concentration Units (ug/L or mg/Kg dry weight): mg/Kg

CAS No.	Analyte	Concentration	C	Q	M	DF
7429-90-5	ALUMINUM	6260			P	1
7440-36-0	ANTIMONY	0.20	U		P	1
7440-38-2	ARSENIC	19.1			P	1
7440-39-3	BARIUM	11.7			P	1
7440-41-7	BERYLLIUM	0.30	B		P	1
7440-43-9	CADMIUM	0.22	U		P	1
7440-70-2	CALCIUM	8550			P	1
7440-47-3	CHROMIUM	14.0			P	1
7440-48-4	COBALT	3.4			P	1
7440-50-8	COPPER	3.7			P	1
7439-89-6	IRON	7300			P	1
7439-92-1	LEAD	6.8			P	1
7439-95-4	MAGNESIUM	894			P	1
7439-96-5	MANGANESE	48.1			P	1
7439-97-6	MERCURY	0.01	B		CV	1
7440-02-0	NICKEL	4.0	B		P	1
7440-09-7	POTASSIUM	653			P	1
7782-49-2	SELENIUM	0.29	U		P	1
7440-22-4	SILVER	0.28	U		P	1
7440-23-5	SODIUM	207			P	1
7440-28-0	THALLIUM	0.50	U		P	1
7440-62-2	VANADIUM	15.6			P	1
7440-66-6	ZINC	14.3			P	1

Color Before: BROWN
Texture: MEDIUM
Color After: YELLOW
Clarity After: CLEAR
Comments:

FORM I - IN

Client:	Katahdin Analytical 340 County Road Westbrook, Maine 04092
Contact:	Ms. Andrea Colby
Project Description:	Former Naval Complex

cc: KATA00199

Report Date: May 27, 1999

Sample ID	: 19SLB11-0405
Lab ID	: 9905110-03
Matrix	: Soil
Date Collected	: 05/04/99
Date Received	: 05/04/99
Priority	: Routine
Collector	: Client

Parameter	Qualifier	Result	DL	RL	Units	DF	Analyst	Date	Time	Batch	M
General Chemistry											
Total Rec. Petro. Hydrocarbons		1890	125	250	mg/kg	1.0	AAT	05/26/99	1000	150070	1
Evaporative Loss @ 105 C		20.0	1.00	1.00	wt%	1.0	GJ	05/05/99	1625	148401	2

M = Method	Method-Description
M 1	SW846 9071A
M 2	EPA 3550

Notes;

The qualifiers in this report are defined as follows:

ND indicates that the analyte was not detected at a concentration greater than the detection limit.

J indicates presence of analyte at a concentration less than the reporting limit (RL) and greater than the detection limit (DL).

U indicates that the analyte was not detected at a concentration greater than the detection limit.

* indicates that a quality control analyte recovery is outside of specified acceptance criteria.

Data reported in mass/mass units is reported as 'dry weight'.

This data report has been prepared and reviewed
in accordance with General Engineering Laboratories
standard operating procedures. Please direct
any questions to your Project Manager, Valerie Davis at (843) 769-7391.

Reviewed By

S. W. COLE ENGINEERING, INC.

REPORT OF GRADATION
ASTM C-117, C-136

Project No. 99008
Date 05/20/1999

Project MISCELLANEOUS

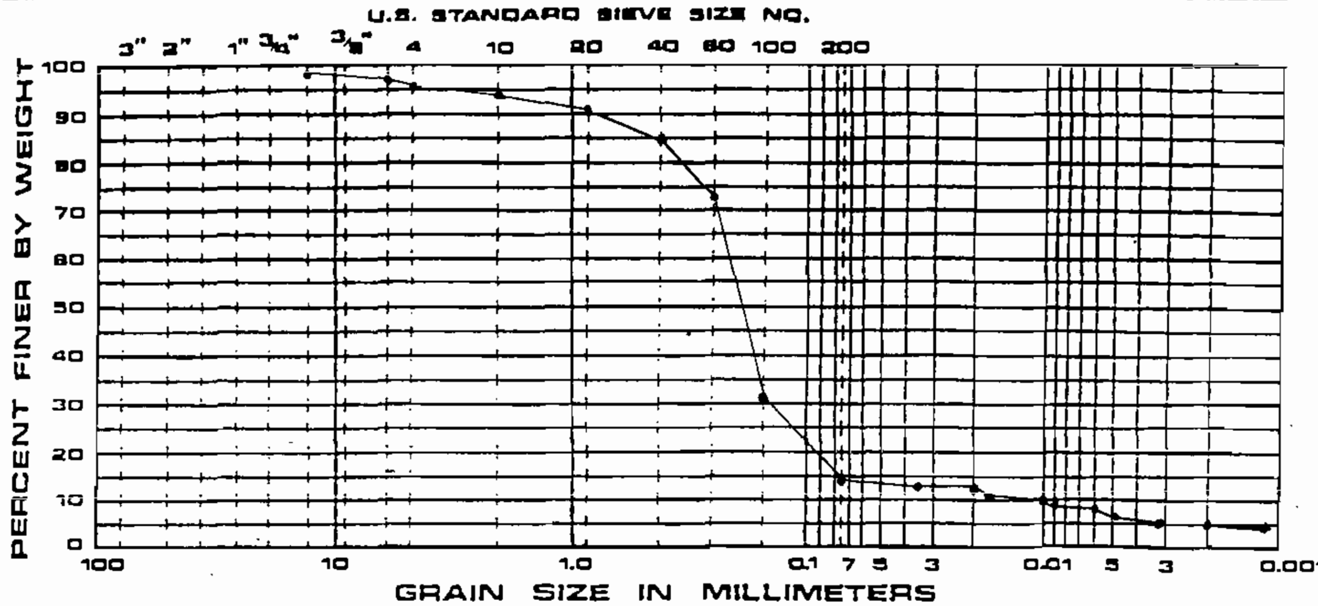
Client KATAHDIN ANALYTICAL

Sample No. 15, SILTY SAND, WP2490-18

Sieve Size	Percent Passing	PROJECT Specifications %
3/4 "	100.0	
1/2 "	98.7	
1/4 "	97.1	
# 4	96.2	
# 10	94.7	
# 20	91.2	
# 40	85.8	
# 60	73.9	
# 100	32.8	
# 200	14.1	

GRAIN SIZE ANALYSIS

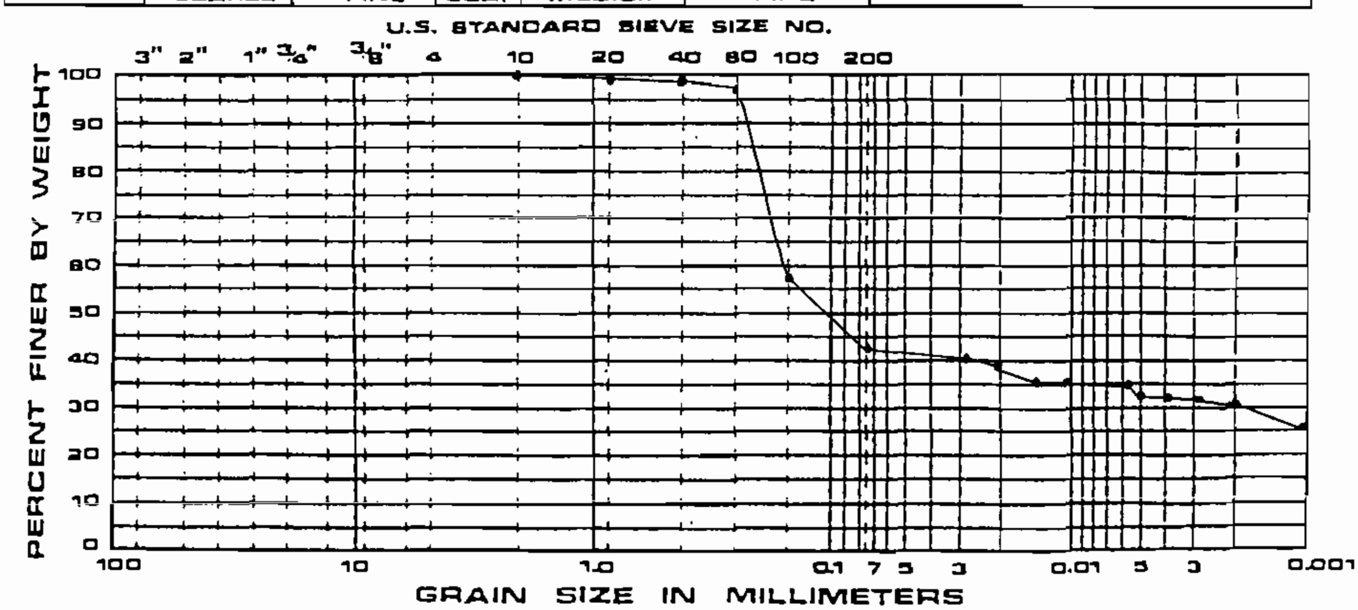
COBBLE	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COA.	MEDIUM	FINE	



PLOT	SOURCE	SAMP.	DEPTH	CLASSIFICATION		W
•	WA2490-18	15				

GRAIN SIZE ANALYSIS

COBBLE	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COA.	MEDIUM	FINE	



PLOT	SOURCE	SAMP.	DEPTH	CLASSIFICATION		W
•	WA250216	16				

Katahdin
ANALYTICAL SERVICES

SDG NARRATIVE
KATAHDIN ANALYTICAL SERVICES
TETRA TECH NUS
CASE CNC CHARLESTON

Sample Receipt

The following samples were received on May 18, 1999 and were logged in under Katahdin Analytical Services work order number WP2490 for a hardcopy due date of June 17, 1999.

KATAHDIN Sample No.	TTNUS Sample Identification	GEL Sample No.
WP2490-1	16SLB01-0203	
WP2490-2	16SLB02-0203	
WP2490-3	16SLB02-0203D	
WP2490-4	16SLB05-0203	
WP2490-5	17SLB01-0708	
WP2490-6	17SLB07-0809	
WP2490-7	17SLB02-0809	
WP2490-8	17SLB09-0708	
WP2490-9	17SLB04-0304	
WP2490-11	17SLB05-0708D	
WP2490-12	17SLB05-0708	
WP2490-13	17SLB03-0506	9905606-01
WP2490-14	18SLB03-00506D	9905606-02
WP2490-15	17SLB03-0506A	
WP2490-16	17SLB03-0506B	
WP2490-17	18SLB03-0304	
WP2490-18	19SLB16-0203	9905606-03
WP2490-19	01TL00103	

The samples were logged in for the analyses specified on the chain of custody form. All problems encountered and resolved during sample receipt have been documented on the applicable chain of custody forms.

Sample analyses have been performed by the methods as noted herein.

Volatile Organic Analysis

One aqueous (trip blank) and thirteen soil/sediment samples were received by the Katahdin Analytical Services, Inc. GC/MS laboratory on May 18, 1999 and were specified to be analyzed by USEPA method 8260B for the analytes benzene, toluene, ethylbenzene, xylenes, MTBE, naphthalene, and EDB.

Analyses for this SDG were performed on instruments 5972-M (low level soil), 5972-Z(low level soil), and 5972-F (aqueous). A VSTD050 (50 ppb standard) was used for the continuing calibration standard. Internal standard and surrogate compounds were also spiked at 50 ug/l.

Batch QC (VBLK, and LCS) was performed in each twelve hour window. Results are included in this data package. The LCS QC samples were spiked with the entire list of compounds quantitated for at 50 ppb. No matrix spike/matrix spike duplicate pair was analyzed on any of the samples in this workorder.

Method 8000B, section 7.5.1.2.1 (Revision 2, 12/96) states, "in those instances where the RSD for one or more analytes exceeds 20%, the initial calibration curve may still be acceptable if the mean of the RSD values for all analytes in the calibration is less than or equal to 20%." Method 8260B narrows this 20% maximum to 15%.

In the calibration curves analyzed in this SDG, several analytes had %RSD values exceeding the allowed 15%. Since the average %RSD for all analytes was 8.4%, 13.4%, and 14.1%, the curves were acceptable.

Initial analyses of samples WP2490-1, WP2490-3, WP2490-5, and WP2490-13 yielded internal standard area and/or surrogate recovery deviations. Reanalyses yielded similar results, confirming matrix interference. Both sets of data for each sample are included in this data package.

Several manual integrations were performed due to split peaks; all have been flagged with a "M" (software-generated) on the pertinent quantitation reports. All "M" flags have been dated and initialed by the analyst performing the integration. In addition, all "M" flags have been reviewed and approved by the GC/MS supervisor. Copies of each manual integration are included in the pertinent quantitation reports.

No other protocol deviations were noted by the volatile organics staff.

Semivolatile Organic Analysis

Thirteen soil/sediment samples were received by the Katahdin GC/MS laboratory on May 18, 1999 for analysis in accordance with 8270C for the TCL/PAH list of analytes.

Extraction of all of the soil samples occurred following USEPA method 3550 on May 25, 1999. A laboratory control spike consisting of all TCL analytes spiked into organic free sand, was extracted in the batch along with a site specific MS/MSD pair on sample WP2490-9.

WP2490-9MS and 9MSD showed an elevated recovery for the surrogate terphenyl-d14, and low recovery of the internal standard Perylene-d12. No action was taken in accordance with the method.

Katahdin
ANALYTICAL SERVICES

Samples WP2490-8,12, and 13 yielded internal standard area recovery deviations. Reanalysis confirmed the internal standard deviations confirming matrix interference. Both sets of data for this sample are included in the data package.

The initial calibration curves analyzed in this SDG had some of the target analyte %RSD values exceeding 15 %.

Method 8000B, section 7.5.1.2.1 (Revision 2, 12/96) states, "in those instances where the RSD for one or more analytes exceeds 20%, the initial calibration curve may still be acceptable if the mean of the RSD values for all analytes in the calibration is less than or equal to 20%." Section 7.3.7.1 of method 8270C (revision 3, 12/96) narrows this 20% maximum to 15%.

In the calibration curves analyzed for this workorder, the average %RSD for all analytes were as follows:

5970-1	6/22/99	8.2%
5970-1	6/28/99	8.7%

Several manual integrations were performed due to split peaks; all have been flagged with a "M" by the data system. All manual integrations have been dated and initialed by the responsible analyst. Copies of each manual integration are included in the data package. All manual integrations have been reviewed and approved by the GC/MS supervisor.

No other protocol deviations were noted by the semivolatiles organics staff.

Wet Chemistry Analysis

For work order WP2490 the analyses for Total Combustible Organics (TCO) have been performed in accordance with the "Annual Book of ASTM Standards", 1987. Analyses for Solids-Total Residue (TS) for work order WP2490 samples have been performed in accordance with "Contract Laboratory Program Statement of Work for Inorganic Analysis".

All analyses were performed within analytical hold time. No protocol deviations were noted by the Wet Chemistry laboratory staff.

I certify that this data package is in compliance with the terms and conditions of the contract, both technically and for completeness, for other than the conditions detailed above. Release of the data contained in this hardcopy data package has been authorized by the Laboratory Manager and/or his designee, as verified by the following signature.

Authorized Signature

KATAHDIN ANALYTICAL SERVICES, INC.
SAMPLE RECEIPT CONDITION REPORT
Tel. (207) 874-2400
Fax (207) 775-4029

LAB (WORK ORDER) #: WP2490

PAGE: 1 OF 2

COOLER: 1 OF 2

CLIENT: Tetratech-SC

PROJECT: CNC Charleston

COC#: —
SDG#: —
DATE / TIME RECEIVED: 05/18/99 ~1010
DELIVERED BY: FEDEX
RECEIVED BY: BKN
LIMS ENTRY BY: Sow
LIMS REVIEW BY / PM: ADC

	YES	NO	EXCEPTIONS	COMMENTS	RESOLUTION
1. CUSTODY SEALS PRESENT / INTACT?	☑	☐	☐		
2. CHAIN OF CUSTODY PRESENT IN THIS COOLER?	☑	☐	☐		
3. CHAIN OF CUSTODY SIGNED BY CLIENT?	☑	☐	☐		
4. CHAIN OF CUSTODY MATCHES SAMPLES?	☑	☐	☐		
5. TEMPERATURE BLANKS PRESENT?	☑	☐	☐	TEMP BLANK TEMP (°C)= 1.1	ADC notified Paul Calligan by fax 5/18/99
6. SAMPLES RECEIVED AT 4°C +/- 2? ICE / ICE PACKS PRESENT Y or N?	☐	☑	☐	COOLER TEMP (°C)= NA (RECORD COOLER TEMP ONLY IF TEMP BLANK IS NOT PRESENT)	
7. VOLATILES FREE OF HEADSPACE?	☑	☐	☐		
8. TRIP BLANK PRESENT IN THIS COOLER	☑	☐	☐		
9. PROPER SAMPLE CONTAINERS AND VOLUME?	☑	☐	☐		
10. SAMPLES WITHIN HOLD TIME UPON RECEIPT?	☑	☐	☐		
11. SAMPLES PROPERLY PRESERVED[1]?	☑	☐	☐		
12. CORRECTIVE ACTION REPORT FILED?	☐	☑	N/A		

13. ANALYTICAL PROGRAMS (CIRCLE ONE) COMMERCIAL CLP HAZWRAP NFESC ACOE AFCEE OTHER (STATE OF ORIGIN): ______

LOG - IN NOTES[1]:

[1] Use thi[s] [spac]e (and additional sheets if necessary) to document samples that are received br[oken] [o]r compromised, C-O-C discrepancies, radiation checks, residual chlorine check, re[su]lts of pH check if [req]uired. If samples required pH adjustment, record volume and type of preservative [added].

KATAHDIN ANALYTICAL SERVICES, INC.
SAMPLE RECEIPT CONDITION REPORT
Tel. (207) 874-2400
Fax (207) 775-4029

LAB (WORK ORDER) # WP2490

PAGE: 2 OF 2

COOLER: 2 OF 2

COC# —
SDG# —
DATE / TIME RECEIVED: 05/18/99~1010
DELIVERED BY: FEDEX
RECEIVED BY: BKK
LIMS ENTRY BY: Saw
LIMS REVIEW BY / PM: KC

CLIENT: Tetratech - SC

PROJECT: CNC charleston

	YES	NO	EXCEPTIONS	COMMENTS	RESOLUTION
1. CUSTODY SEALS PRESENT / INTACT?	☑	☐	☐		
2.CHAIN OF CUSTODY PRESENT IN THIS COOLER?	☑	☐	☐		
3. CHAIN OF CUSTODY SIGNED BY CLIENT?	☑	☐	☐		
4. CHAIN OF CUSTODY MATCHES SAMPLES?	☑	☐	☐		
5. TEMPERATURE BLANKS PRESENT?	☑	☐	☐	TEMP BLANK TEMP (°C)= 4.1	
6. SAMPLES RECEIVED AT 4°C +/- 2? ICE / ICE PACKS PRESENT Y or N?	☑	☐	☐	COOLER TEMP (°C)= NA (RECORD COOLER TEMP ONLY IF TEMP BLANK IS NOT PRESENT)	
7. VOLATILES FREE OF HEADSPACE?	☐	☐	☑		
8. TRIP BLANK PRESENT IN THIS COOLER	☐	☑	☐		
9. PROPER SAMPLE CONTAINERS AND VOLUME?	☑	☐	☐		
10. SAMPLES WITHIN HOLD TIME UPON RECEIPT?	☑	☐	☐		
11. SAMPLES PROPERLY PRESERVED[1]?	☑	☐	☐		
12. CORRECTIVE ACTION REPORT FILED?	☐	☑	N/A		

13. ANALYTICAL PROGRAMS (CIRCLE ONE) COMMERCIAL CLP HAZWRAP NFESC ACOE AFCEE OTHER (STATE OF ORIGIN):

LOG - IN NOTES[1]:

[1] Use this space (and additional sheets if necessary) to document samples that are received broken or compromised, C-O-C discrepancies, radiation checks, residual chlorine check, results of pH check if required. If samples required pH adjustment, record volume and type of preservative added.

000006

Katahdin Analytical Services
340 County Road No. 5
P.O. Box 720
Westbrook, ME 04098
Tel: (207) 874-2400
Fax: (207) 775-4029

CHAIN of CUSTODY

PLEASE PRINT IN PEN

Client: Tetra Tech NUS
Contact: Bryn Howze
Phone #: (423) 483-9900
Fax #: ( )

Address: NH-21 Ave. H
City: North Charleston
State: SC
Zip Code: 29405

Purchase Order #
Proj. Name / No.
Katahdin Quote #

Bill (if different than above)
Address

Sampler (Print / Sign)
Copies To:

LAB USE ONLY
WORK ORDER #: WP2490
KATAHDIN PROJECT MANAGER

REMARKS:

SHIPPING INFO: ❒ FED EX ❒ UPS ❒ CLIENT
AIRBILL NO:
TEMP°C ❒ TEMP BLANK ❒ INTACT ❒ NOT INTACT

ANALYSIS AND CONTAINER TYPE PRESERVATIVES

*	Sample Description	Date / Time coll'd	Matrix	No. of Cntrs.	PAHs + Napth 8070C	TAL metals 6010B	BTEX, EDB 8260B 9071A	Grain Size Hydrometer						
					Filt. ❒Y❒N	Filt. ❒Y❒N	Filt. ❒Y❒N	Filt. ❒Y❒N	Filt. ❒Y❒N	Filt. ❒Y❒N	Filt. ❒Y❒N	Filt. ❒Y❒N	Filt. ❒Y❒N	Filt. ❒Y❒N
	19SLB16-0203	5/17 / 1640	S	1				X						
		/												
		/												
		/												
		/												
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		/												
		/												

COMMENTS

Relinquished By: (Signature)	Date / Time	Received By: (Signature)	Relinquished By: (Signature)	Date / Time	Received By: (Signature)
[signature]	5/17/99 1752	809649615Ø298		05/18/99 1010	[signature]
Relinquished By: (Signature)	Date / Time	Received By: (Signature)	Relinquished By: (Signature)	Date / Time	Received By: (Signature)

S. W. COLE ENGINEERING, INC.

REPORT OF GRADATION
ASTM C-117, C-136

Project No. 99008
Date 05/20/1999

Project MISCELLANEOUS

Client KATAHDIN ANALYTICAL

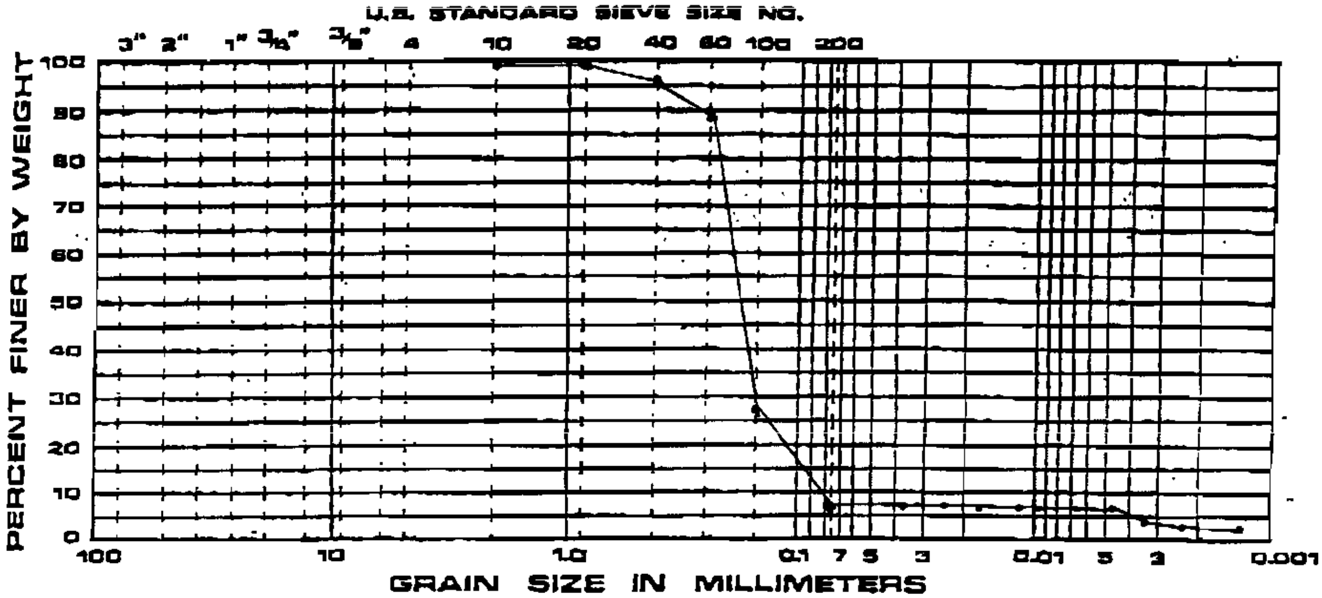
Sample No. 14, SILTY SAND, WP2490-17

Sieve Size	Percent Passing	PROJECT Specifications %
# 4	100.0	
# 10	99.9	
# 20	99.4	
# 40	96.9	
# 60	88.0	
# 100	27.8	
# 200	7.3	

JOB NO: 99-008

GRAIN SIZE ANALYSIS

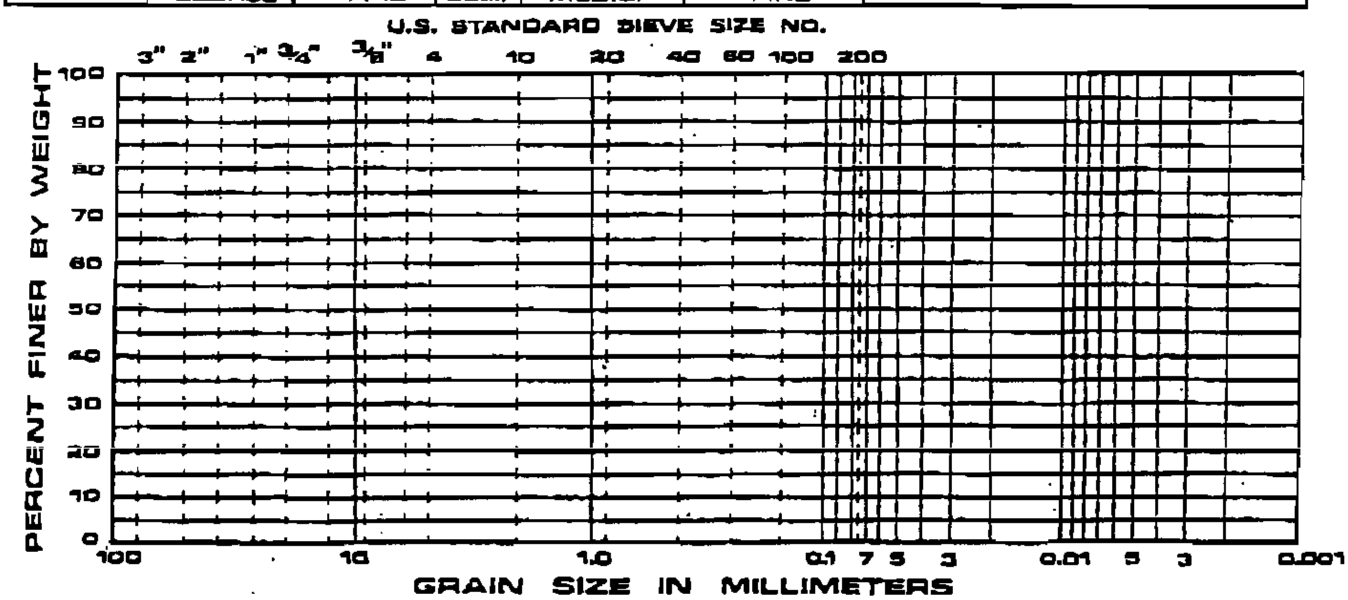
COBBLE	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COA.	MEDIUM	FINE	



PLOT	SOURCE	SAMP.	DEPTH	CLASSIFICATION		W
•	WB24BD-17	14				

GRAIN SIZE ANALYSIS

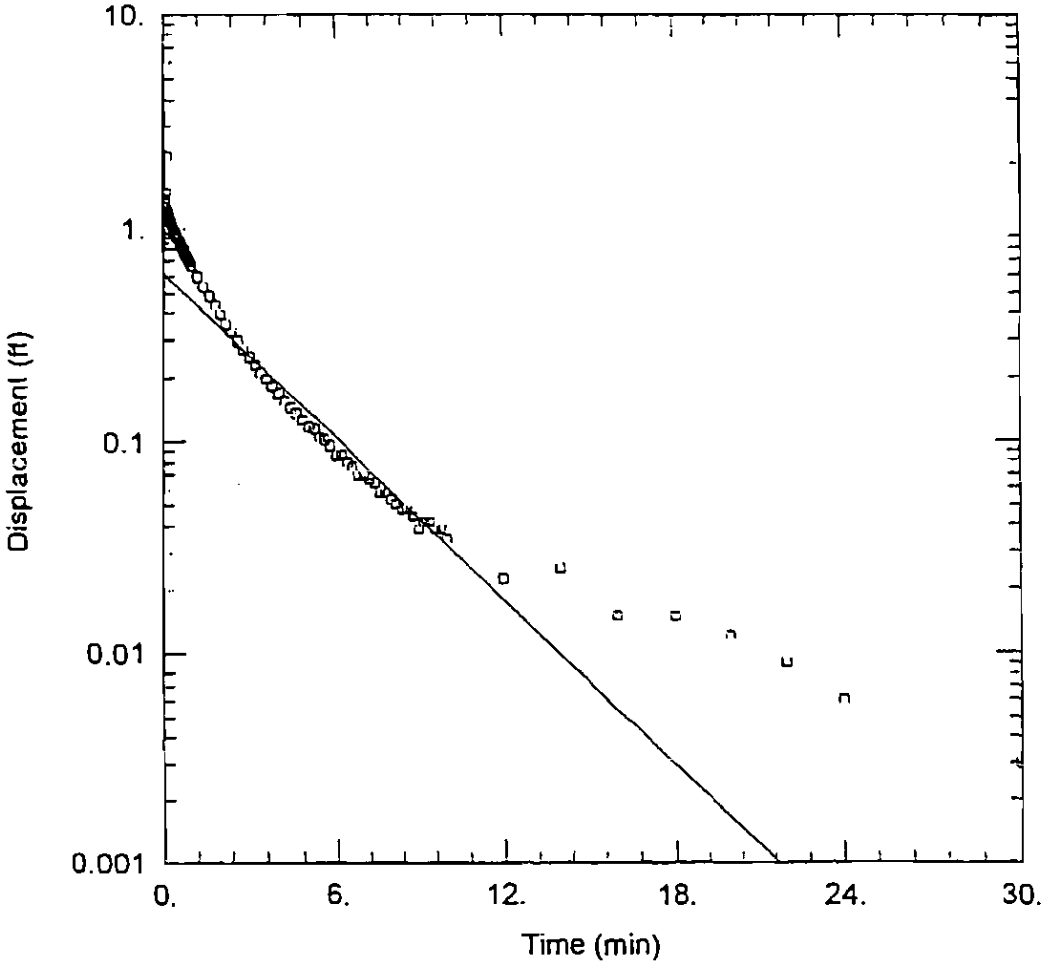
COBBLE	GRAVEL		SAND			SILT OR CLAY
	COARSE	FINE	COA.	MEDIUM	FINE	



PLOT	SOURCE	SAMP.	DEPTH	CLASSIFICATION		W

APPENDIX E

AQUIFER CHARACTERIZATION GRAPHS



FDS01C INJECTION

Data Set: C:\TEMP\CHARLE~1\0-01C.AQT
Date: 06/21/99 Time: 12:32:13

PROJECT INFORMATION

Company: EnSafe
Client: SouthDiv
Project: 0144
Test Location: Charleston
Test Well: FDS01C
Test Date: 6/2/99

AQUIFER DATA

Saturated Thickness: 40. ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA

Initial Displacement: 1.28 ft Water Column Height: 4.75 ft
Casing Radius: 0.0833 ft Wellbore Radius: 0.333 ft
Screen Length: 10. ft Gravel Pack Porosity: 0.3

SOLUTION

Data Set: C:\TEMP\CHARLE~1\0-01C.AQT
Title: FDS01C Injection
Date: 06/21/99
Time: 14:28:42

PROJECT INFORMATION

Company: EnSafe
Client: SouthDiv
Project: 0144
Location: Charleston
Test Date: 6/2/99
Test Well: FDS01C

AQUIFER DATA

Saturated Thickness: 40. ft
Anisotropy Ratio (Kz/Kr): 1.

OBSERVATION WELL DATA

Number of observation wells: 1

Observation Well No. 1: FDS01C

X Location: 0. ft
Y Location: 0. ft

No. of observations: 125

Observation Data

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.075	1.283	0.5166	0.9	3.6	0.196
0.0833	1.388	0.5333	0.89	3.8	0.18
0.0916	1.362	0.55	0.877	4.	0.167
0.1	1.343	0.5666	0.871	4.2	0.155
0.1083	1.327	0.5833	0.862	4.4	0.145
0.1166	0.9	0.6	0.849	4.6	0.136
0.125	2.19	0.6166	0.842	4.8	0.126
0.1333	1.477	0.6333	0.833	5.	0.117
0.1416	1.229	0.65	0.823	5.2	0.114
0.15	1.236	0.6666	0.817	5.4	0.104
0.1583	1.22	0.6833	0.804	5.6	0.101
0.1666	1.207	0.7	0.798	5.8	0.095
0.175	1.198	0.7166	0.789	6.	0.085
0.1833	1.188	0.7333	0.776	6.2	0.085
0.1916	1.178	0.75	0.773	6.4	0.079
0.2	1.169	0.7666	0.766	6.6	0.076
0.2083	1.156	0.7833	0.757	6.8	0.069
0.2166	1.144	0.8	0.747	7.	0.069

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.225	1.137	0.8166	0.741	7.2	0.066
0.2333	1.128	0.8333	0.735	7.4	0.063
0.2416	1.115	0.85	0.728	7.6	0.057
0.25	1.109	0.8666	0.719	7.8	0.057
0.2583	1.099	0.8833	0.716	8.	0.053
0.2666	1.093	0.9	0.706	8.2	0.05
0.275	1.087	0.9166	0.7	8.4	0.047
0.2833	1.077	0.9333	0.69	8.6	0.047
0.2916	1.071	0.95	0.687	8.8	0.044
0.3	1.061	0.9666	0.675	9.	0.038
0.3083	1.055	0.9833	0.671	9.2	0.041
0.3166	1.049	1.	0.665	9.4	0.041
0.325	1.039	1.2	0.592	9.6	0.038
0.3333	1.03	1.4	0.532	9.8	0.038
0.35	1.017	1.6	0.478	10.	0.034
0.3666	1.004	1.8	0.434	12.	0.022
0.3833	0.995	2.	0.396	14.	0.025
0.4	0.979	2.2	0.358	16.	0.015
0.4166	0.969	2.4	0.326	18.	0.015
0.4333	0.953	2.6	0.297	20.	0.012
0.45	0.944	2.8	0.272	22.	0.009
0.4666	0.934	3.	0.25	24.	0.006
0.4833	0.922	3.2	0.231	30.	0.003
0.5	0.912	3.4	0.212		

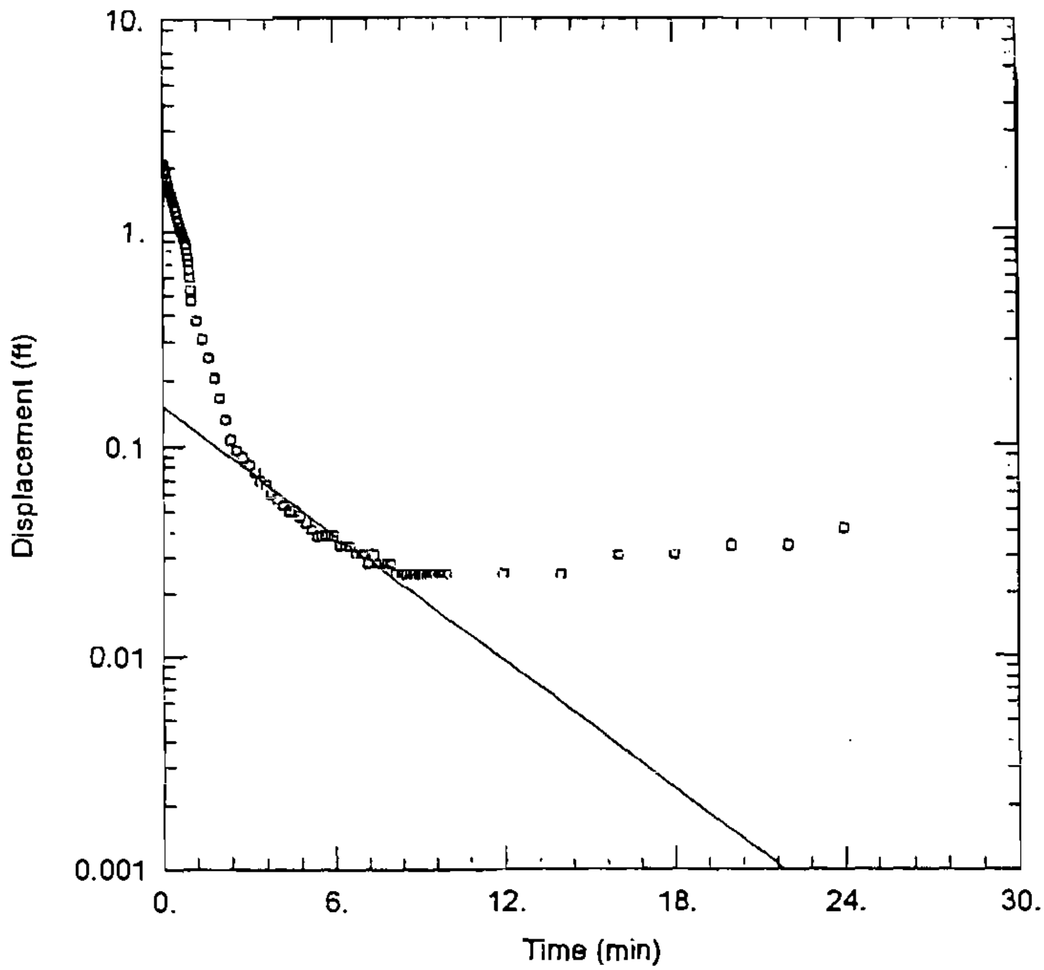
SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	0.001029	ft/min
y0	0.2415	ft



FDS01C - WITHDRAWAL

Data Set: C:\TEMP\CHARLE~1\0-11C.AQT
Date: 06/21/99 Time: 12:34:56

PROJECT INFORMATION

Company: EnSafe
Client: SouthDiv
Project: 0144
Test Location: Charleston
Test Well: FDS01c
Test Date: 6/2/99

AQUIFER DATA

Saturated Thickness: 40. ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA

Initial Displacement: 2.086 ft
Casing Radius: 0.0833 ft
Screen Length: 10. ft
Water Column Height: 4.75 ft
Wellbore Radius: 0.333 ft
Gravel Pack Porosity: 0.3

SOLUTION

Aquifer Model: Unconfined
K = 0.001499 ft/min

Data Set: C:\TEMP\CHARLE~1\0-11C.AQT
Title: FDS01C - Withdrawal
Date: 06/21/99
Time: 14:34:19

PROJECT INFORMATION

Company: EnSafe
Client: SouthDiv
Project: 0144
Location: Charleston
Test Date: 6/2/99
Test Well: FDS01c

AQUIFER DATA

Saturated Thickness: 40. ft
Anisotropy Ratio (Kz/Kr): 1.

OBSERVATION WELL DATA

Number of observation wells: 1

Observation Well No. 1: FDS01D

X Location: 0. ft
Y Location: 0. ft

No. of observations: 130

Observation Data

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.025	2.077	0.45	1.244	3.2	0.076
0.0333	2.049	0.4666	1.222	3.4	0.069
0.0416	2.017	0.4833	1.2	3.6	0.066
0.05	1.989	0.5	1.178	3.8	0.06
0.0583	1.966	0.5166	1.156	4.	0.057
0.0666	1.941	0.5333	1.134	4.2	0.053
0.075	1.919	0.55	1.115	4.4	0.05
0.0833	1.897	0.5666	1.096	4.6	0.05
0.0916	1.875	0.5833	1.073	4.8	0.047
0.1	1.856	0.6	1.058	5.	0.044
0.1083	1.833	0.6166	1.039	5.2	0.041
0.1166	1.814	0.6333	1.02	5.4	0.038
0.125	1.795	0.65	1.004	5.6	0.038
0.1333	1.776	0.6666	0.985	5.8	0.038
0.1416	1.757	0.6833	0.969	6.	0.038
0.15	1.738	0.7	0.953	6.2	0.034
0.1583	1.723	0.7166	0.937	6.4	0.034
0.1666	1.704	0.7333	0.918	6.6	0.034

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.175	1.688	0.75	0.906	6.8	0.031
0.1833	1.672	0.7666	0.89	7.	0.031
0.1916	1.656	0.7833	0.874	7.2	0.028
0.2	1.643	0.8	0.852	7.4	0.031
0.2083	1.628	0.8166	0.83	7.6	0.028
0.2166	1.612	0.8333	0.807	7.8	0.028
0.225	1.599	0.85	0.785	8.	0.028
0.2333	1.583	0.8666	0.763	8.2	0.025
0.2416	1.567	0.8833	0.738	8.4	0.025
0.25	1.555	0.9	0.715	8.6	0.025
0.2583	1.542	0.9166	0.69	8.8	0.025
0.2666	1.529	0.9333	0.655	9.	0.025
0.275	1.514	0.95	0.598	9.2	0.025
0.2833	1.501	0.9666	0.529	9.4	0.025
0.2916	1.485	0.9833	0.475	9.6	0.025
0.3	1.472	1.	0.465	9.8	0.025
0.3083	1.46	1.2	0.377	10.	0.025
0.3166	1.444	1.4	0.31	12.	0.025
0.325	1.431	1.6	0.253	14.	0.025
0.3333	1.419	1.8	0.205	16.	0.031
0.35	1.39	2.	0.167	18.	0.031
0.3666	1.365	2.2	0.133	20.	0.034
0.3833	1.339	2.4	0.107	22.	0.034
0.4	1.314	2.6	0.095	24.	0.041
0.4166	1.292	2.8	0.088		
0.4333	1.27	3.	0.082		

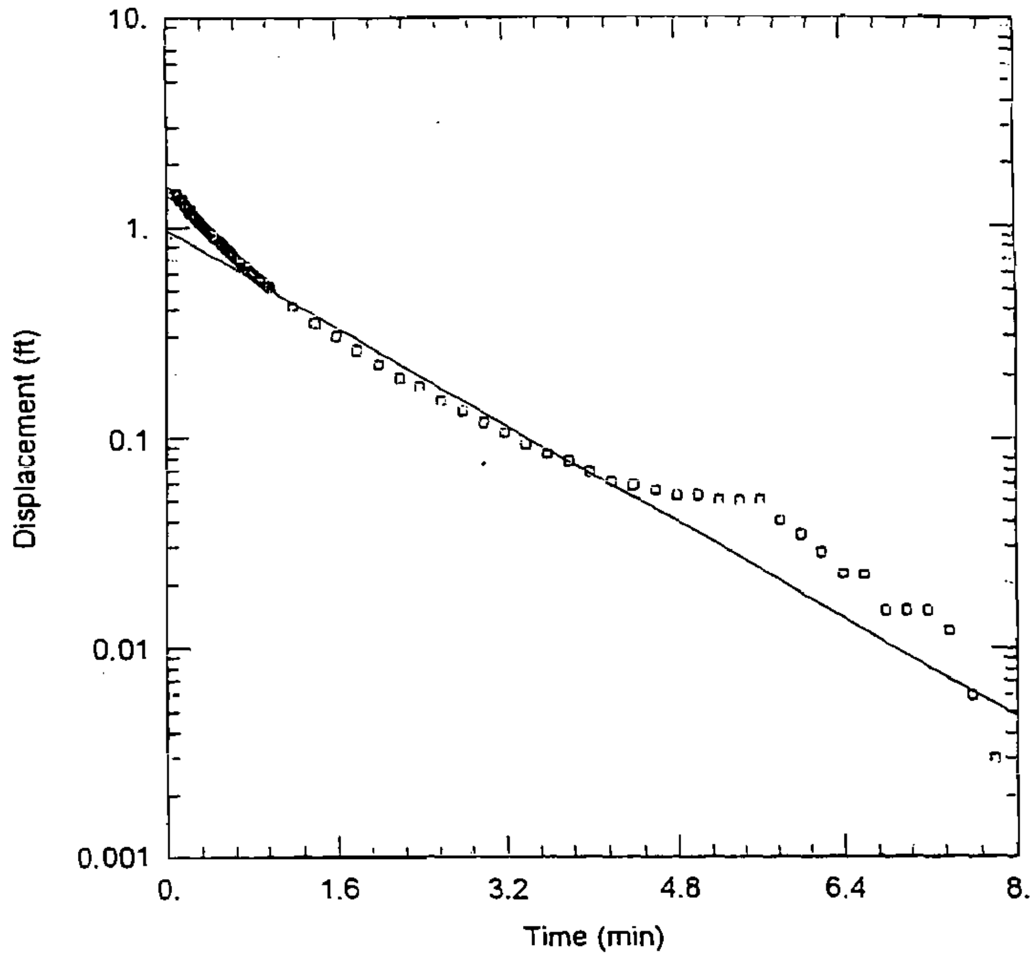
SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	0.001499	ft/min
y0	0.1538	ft



FDS01D INJECTION

Data Set: C:\TEMP\CHARLE~1\0-01D.AQT
Date: 06/21/99 Time: 12:36:01

PROJECT INFORMATION

Company: EnSafe
Client: SouthDiv
Project: 0144
Test Location: Charleston
Test Well: FDS01D
Test Date: 6/2/99

AQUIFER DATA

Saturated Thickness: 41. ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA

Initial Displacement: 1.472 ft Water Column Height: 4.65 ft
Casing Radius: 0.0833 ft Wellbore Radius: 0.333 ft
Screen Length: 10. ft Gravel Pack Porosity: 0.3

SOLUTION

Aquifer Model: Unconfined K = 0.002256 ft/min

Data Set: C:\TEMP\CHARLE~1\0-01D.AQT
Title: FDS01D Injection
Date: 06/21/99
Time: 14:29:05

PROJECT INFORMATION

Company: EnSafe
Client: SouthDiv
Project: 0144
Location: Charleston
Test Date: 6/2/99
Test Well: FDS01D

AQUIFER DATA

Saturated Thickness: 41. ft
Anisotropy Ratio (Kz/Kr): 1.

OBSERVATION WELL DATA

Number of observation wells: 1

Observation Well No. 1: FDS01D

X Location: 0. ft
Y Location: 0. ft

No. of observations: 106

Observation Data

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.075	1.438	0.4166	0.934	1.2	0.418
0.0833	1.431	0.4333	0.915	1.4	0.352
0.0916	1.416	0.45	0.896	1.6	0.302
0.1	1.447	0.4666	0.877	1.8	0.261
0.1083	1.384	0.4833	0.868	2.	0.223
0.1166	1.334	0.5	0.849	2.2	0.195
0.125	1.362	0.5166	0.836	2.4	0.176
0.1333	1.334	0.5333	0.818	2.6	0.151
0.1416	1.343	0.55	0.802	2.8	0.135
0.15	1.368	0.5666	0.786	3.	0.119
0.1583	1.293	0.5833	0.777	3.2	0.106
0.1666	1.29	0.6	0.761	3.4	0.094
0.175	1.265	0.6166	0.745	3.6	0.084
0.1833	1.252	0.6333	0.733	3.8	0.078
0.1916	1.242	0.65	0.717	4.	0.069
0.2	1.227	0.6666	0.704	4.2	0.062
0.2083	1.217	0.6833	0.692	4.4	0.059
0.2166	1.167	0.7	0.679	4.6	0.056

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.225	1.227	0.7166	0.667	4.8	0.053
0.2333	1.17	0.7333	0.651	5.	0.053
0.2416	1.157	0.75	0.645	5.2	0.05
0.25	1.145	0.7666	0.629	5.4	0.05
0.2583	1.132	0.7833	0.622	5.6	0.05
0.2666	1.12	0.8	0.613	5.8	0.04
0.275	1.11	0.8166	0.604	6.	0.034
0.2833	1.101	0.8333	0.594	6.2	0.028
0.2916	1.085	0.85	0.585	6.4	0.022
0.3	1.076	0.8666	0.575	6.6	0.022
0.3083	1.066	0.8833	0.566	6.8	0.015
0.3166	1.054	0.9	0.556	7.	0.015
0.325	1.041	0.9166	0.547	7.2	0.015
0.3333	1.032	0.9333	0.541	7.4	0.012
0.35	1.013	0.95	0.528	7.6	0.006
0.3666	0.991	0.9666	0.522	7.8	0.003
0.3833	0.972	0.9833	0.512		
0.4	0.953	1.	0.503		

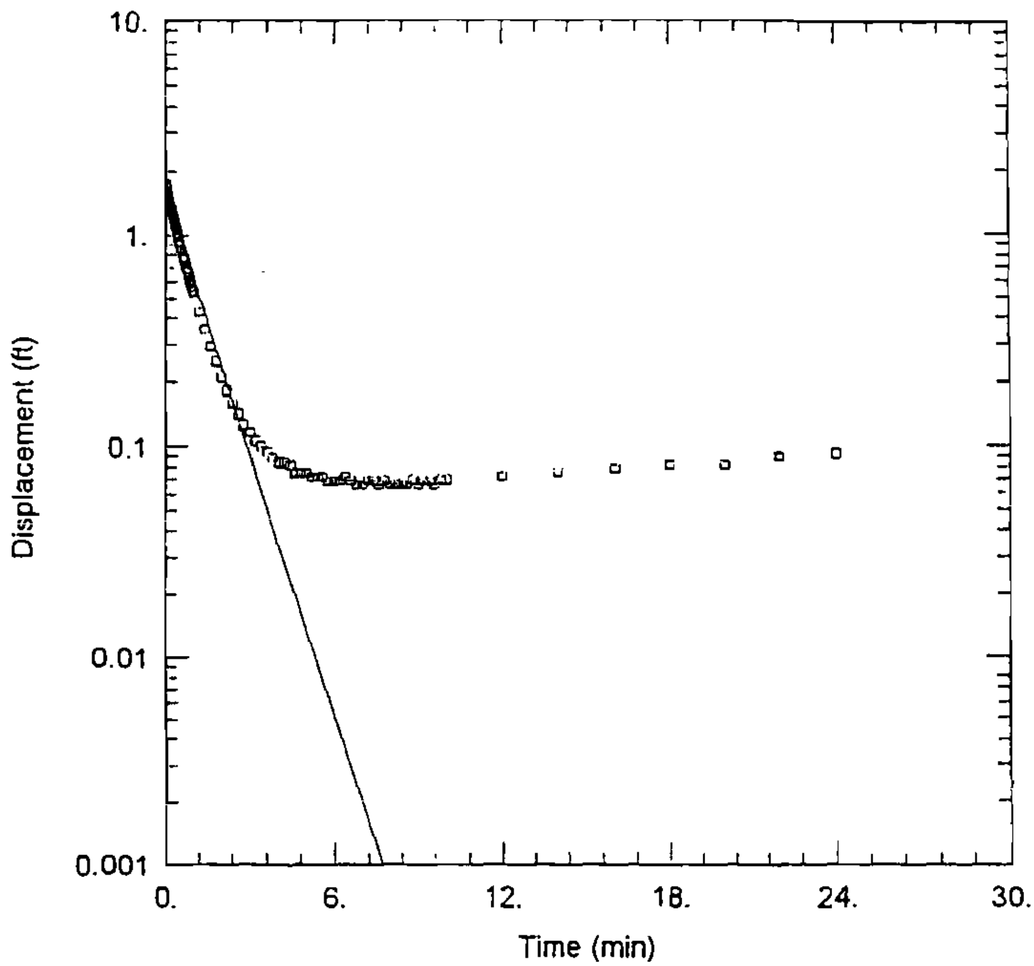
SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	0.002256	ft/min
y0	0.9666	ft



FDS01D - WITHDRAWAL

Data Set: C:\TEMP\CHARLE~1\0-11D.AQT
Date: 06/17/99 Time: 14:14:46

PROJECT INFORMATION

Company: EnSafe
Client: SouthDiv
Project: 0144
Test Location: Charleston
Test Well: FDS01D
Test Date: 6/2/99

AQUIFER DATA

Saturated Thickness: 41. ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA

Initial Displacement: 1.708 ft
Casing Radius: 0.0833 ft
Screen Length: 10. ft
Water Column Height: 4.65 ft
Wellbore Radius: 0.333 ft
Gravel Pack Porosity: 0.3

SOLUTION

Aquifer Model: Unconfined K = 0.003255 ft/min

'a Set: C:\TEMP\CHARLE~1\0-11D.AQT
..e: FDS01D - Withdrawal
Date: 06/21/99
Time: 14:35:40

PROJECT INFORMATION

Company: EnSafe
Client: SouthDiv
Project: 0144
Location: Charleston
Test Date: 6/2/99
Test Well: FDS01D

AQUIFER DATA

Saturated Thickness: 41. ft
Anisotropy Ratio (Kz/Kr): 1.

OBSERVATION WELL DATA

Number of observation wells: 1

Observation Well No. 1: FDS01D

X Location: 0. ft
Y Location: 0. ft

No. of observations: 130

Observation Data

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.025	1.739	0.45	0.984	3.2	0.106
0.0333	1.688	0.4666	0.956	3.4	0.1
0.0416	1.666	0.4833	0.934	3.6	0.094
0.05	1.638	0.5	0.921	3.8	0.066
0.0583	1.616	0.5166	0.902	4.	0.084
0.0666	1.594	0.5333	0.886	4.2	0.084
0.075	1.575	0.55	0.868	4.4	0.081
0.0833	1.559	0.5666	0.852	4.6	0.075
0.0916	1.537	0.5833	0.836	4.8	0.075
0.1	1.519	0.6	0.82	5.	0.075
0.1083	1.5	0.6166	0.805	5.2	0.072
0.1166	1.484	0.6333	0.789	5.4	0.072
0.125	1.465	0.65	0.773	5.6	0.072
0.1333	1.449	0.6666	0.761	5.8	0.069
0.1416	1.43	0.6833	0.748	6.	0.069
0.15	1.415	0.7	0.732	6.2	0.069
0.1583	1.399	0.7166	0.72	6.4	0.072
0.1666	1.386	0.7333	0.707	6.6	0.069

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.175	1.368	0.75	0.695	6.8	0.066
0.1633	1.355	0.7666	0.682	7.	0.066
0.1916	1.342	0.7833	0.669	7.2	0.069
0.2	1.324	0.8	0.657	7.4	0.069
0.2083	1.311	0.8166	0.644	7.6	0.066
0.2166	1.295	0.8333	0.635	7.8	0.069
0.225	1.286	0.85	0.622	8.	0.066
0.2333	1.273	0.8666	0.61	8.2	0.066
0.2416	1.254	0.8833	0.6	8.4	0.066
0.25	1.245	0.9	0.591	8.6	0.066
0.2583	1.232	0.9166	0.578	8.8	0.069
0.2666	1.22	0.9333	0.569	9.	0.066
0.275	1.21	0.95	0.559	9.2	0.069
0.2833	1.198	0.9666	0.55	9.4	0.069
0.2916	1.188	0.9833	0.541	9.6	0.066
0.3	1.176	1.	0.531	9.8	0.069
0.3083	1.163	1.2	0.43	10.	0.069
0.3166	1.151	1.4	0.352	12.	0.072
0.325	1.138	1.6	0.292	14.	0.075
0.3333	1.129	1.8	0.248	16.	0.078
0.35	1.107	2.	0.21	18.	0.081
0.3666	1.085	2.2	0.182	20.	0.081
0.3833	1.063	2.4	0.16	22.	0.088
0.4	1.047	2.6	0.141	24.	0.091
0.4166	1.022	2.8	0.125		
0.4333	1.003	3.	0.116		

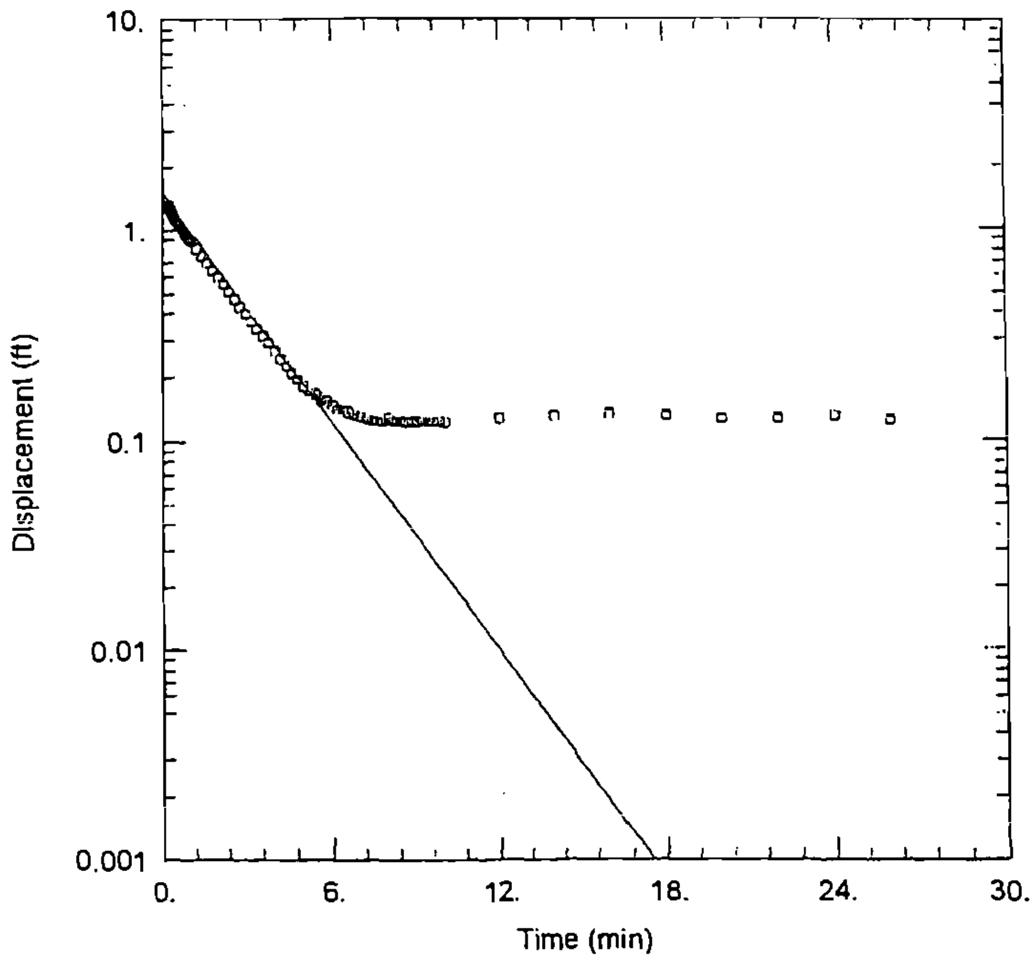
SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	0.003255	ft/min
y0	1.617	ft



FDS01A INJECTION	
Data Set: C:\TEMP\CHARLE~1\1-01A.AQT	
Date: 06/21/99	Time: 09:11:27

PROJECT INFORMATION

Company: EnSafe
Client: SouthDiv
Project: 0144
Test Location: Charleston
Test Well: FDS01A
Test Date: 6/3/99

AQUIFER DATA

Saturated Thickness: 41. ft
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA

Initial Displacement: 1.325 ft
Casing Radius: 0.0833 ft
Screen Length: 10. ft
Water Column Height: 4.64 ft
Wellbore Radius: 0.333 ft
Gravel Pack Porosity: 0.3

SOLUTION

Aquifer Model: Unconfined
K = 0.002708 ft/min

Data Set: C:\TEMP\CHARLE~1\1-01A.AQT
Title: FDS01A Injection
Date: 06/21/99
Time: 14:36:48

PROJECT INFORMATION

Company: EnSafe
Client: SouthDiv
Project: 0144
Location: Charleston
Test Date: 6/3/99
Test Well: FDS01A

AQUIFER DATA

Saturated Thickness: 41. ft
Anisotropy Ratio (Kz/Kr): 1.

OBSERVATION WELL DATA

Number of observation wells: 1

Observation Well No. 1: FDS01A

X Location: 0. ft
Y Location: 0. ft

No. of observations: 110

Observation Data

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.2	1.325	0.6833	1.018	4.6	0.209
0.2083	1.306	0.7	1.012	4.8	0.194
0.2166	1.291	0.7166	1.002	5.	0.181
0.225	1.288	0.7333	0.996	5.2	0.172
0.2333	1.278	0.75	0.984	5.4	0.166
0.2416	1.275	0.7666	0.98	5.6	0.159
0.25	1.266	0.7833	0.971	5.8	0.153
0.2583	1.263	0.8	0.968	6.	0.147
0.2666	1.256	0.8166	0.958	6.2	0.141
0.275	1.247	0.8333	0.952	6.4	0.141
0.2833	1.244	0.85	0.943	6.6	0.137
0.2916	1.237	0.8666	0.94	6.8	0.134
0.3	1.234	0.8833	0.93	7.	0.131
0.3083	1.225	0.9	0.924	7.2	0.128
0.3166	1.222	0.9166	0.918	7.4	0.125
0.325	1.216	0.9333	0.915	7.6	0.125
0.3333	1.209	0.95	0.905	7.8	0.125
0.35	1.2	0.9666	0.899	8.	0.128

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.3666	1.187	0.9833	0.893	8.2	0.125
0.3833	1.175	1.	0.886	8.4	0.125
0.4	1.165	1.2	0.814	8.6	0.122
0.4166	1.156	1.4	0.748	8.8	0.125
0.4333	1.147	1.6	0.692	9.	0.122
0.45	1.137	1.8	0.639	9.2	0.125
0.4666	1.125	2.	0.595	9.4	0.125
0.4833	1.118	2.2	0.548	9.6	0.125
0.5	1.106	2.4	0.504	9.8	0.125
0.5166	1.096	2.6	0.47	10.	0.122
0.5333	1.09	2.8	0.432	12.	0.128
0.55	1.078	3.	0.401	14.	0.131
0.5666	1.074	3.2	0.369	16.	0.134
0.5833	1.065	3.4	0.341	18.	0.131
0.6	1.053	3.6	0.313	20.	0.128
0.6166	1.046	3.8	0.291	22.	0.128
0.6333	1.04	4.	0.266	24.	0.131
0.65	1.034	4.2	0.244	26.	0.125
0.6666	1.024	4.4	0.228		

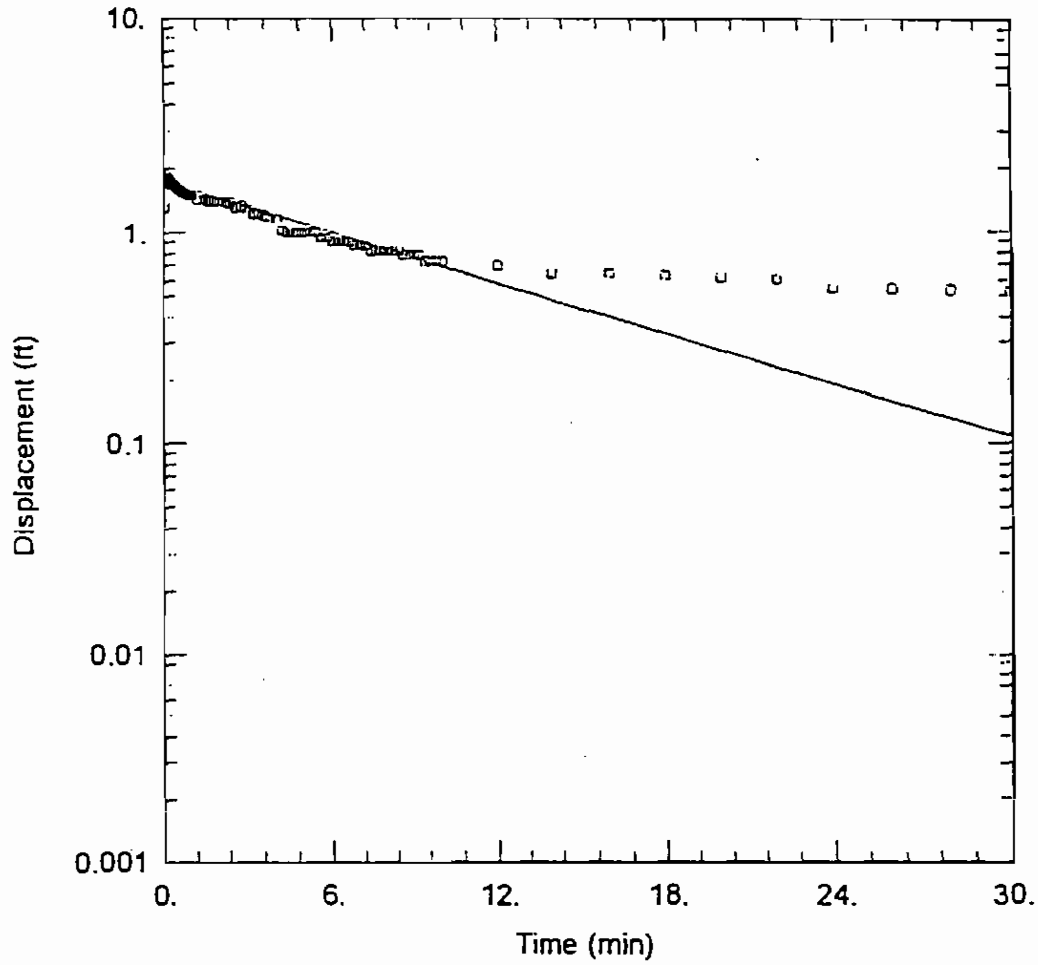
SOLUTION

Aquifer Model: Unconfined
olution Method: Hvorslev

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	0.002708	ft/min
y0	1.503	ft



FDS01A WITHDRAWAL

Data Set: C:\TEMP\CHARLE~1\1-11A.AQT
Date: 06/21/99 Time: 09:39:36

PROJECT INFORMATION

Company: EnSafe
Client: SouthDiv
Project: 0144
Test Location: Charleston
Test Well: FDS01A
Test Date: 6/3/99

AQUIFER DATA

Saturated Thickness: 41. ft Anisotropy Ratio (Kz/Kr): 1.

WELL DATA

Initial Displacement: 1.325 ft Water Column Height: 4.64 ft
Casing Radius: 0.0833 ft Wellbore Radius: 0.333 ft
Screen Length: 10. ft Gravel Pack Porosity: 0.3

SOLUTION

Aquifer Model: Unconfined K = 0.0006018 ft/min

ta Set: C:\TEMP\CHARLE~1\1-11A.AQT
e: FDS01A Withdrawal
Date: 06/21/99
Time: 14:36:12

PROJECT INFORMATION

Company: EnSafe
Client: SouthDiv
Project: 0144
Location: Charleston
Test Date: 6/3/99
Test Well: FDS01A

AQUIFER DATA

Saturated Thickness: 41. ft
Anisotropy Ratio (Kz/Kr): 1.

OBSERVATION WELL DATA

Number of observation wells: 1

bservation Well No. 1: FDS01A

X Location: 0. ft
Y Location: 0. ft

No. of observations: 131

Observation Data

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.0416	1.863	0.4833	1.622	3.6	1.199
0.05	1.857	0.5	1.616	3.8	1.165
0.0583	1.838	0.5166	1.606	4.	1.165
0.0666	1.838	0.5333	1.603	4.2	1.027
0.075	1.835	0.55	1.597	4.4	1.011
0.0833	1.829	0.5666	1.591	4.6	1.011
0.0916	1.819	0.5833	1.585	4.8	1.008
0.1	1.816	0.6	1.578	5.	1.005
0.1083	1.81	0.6166	1.575	5.2	1.005
0.1166	1.81	0.6333	1.569	5.4	1.005
0.125	1.794	0.65	1.566	5.6	0.949
0.1333	1.791	0.6666	1.56	5.8	0.949
0.1416	1.788	0.6833	1.556	6.	0.911
0.15	1.779	0.7	1.55	6.2	0.908
0.1583	1.776	0.7166	1.544	6.4	0.908
0.1666	1.769	0.7333	1.544	6.6	0.908
0.175	1.763	0.75	1.538	6.8	0.87
0.1833	1.76	0.7666	1.531	7.	0.87

Time (min)	Displacement (ft)	Time (min)	Displacement (ft)	Time (min)	Displacement (ft)
0.1916	1.76	0.7833	1.531	7.2	0.87
0.2	1.751	0.8	1.525	7.4	0.823
0.2083	1.744	0.8166	1.522	7.6	0.823
0.2166	1.741	0.8333	1.519	7.8	0.823
0.225	1.735	0.85	1.513	8.	0.82
0.2333	1.729	0.8666	1.513	8.2	0.82
0.2416	1.729	0.8833	1.509	8.4	0.82
0.25	1.725	0.9	1.503	8.6	0.786
0.2583	1.719	0.9166	1.5	8.8	0.783
0.2666	1.713	0.9333	1.5	9.	0.78
0.275	1.71	0.95	1.494	9.2	0.78
0.2833	1.704	0.9666	1.491	9.4	0.733
0.2916	1.7	0.9833	1.491	9.6	0.733
0.3	1.697	1.	1.487	9.8	0.729
0.3083	1.694	1.2	1.45	10.	0.733
0.3166	1.691	1.4	1.428	12.	0.698
0.325	1.688	1.6	1.412	14.	0.642
0.3333	1.682	1.8	1.403	16.	0.636
0.35	1.675	2.	1.4	18.	0.626
0.3666	1.666	2.2	1.394	20.	0.617
0.3833	1.657	2.4	1.39	22.	0.604
0.4	1.65	2.6	1.334	24.	0.545
0.4166	1.647	2.8	1.334	26.	0.538
0.4333	1.641	3.	1.284	28.	0.532
0.45	1.635	3.2	1.231	30.	0.523
0.4666	1.632	3.4	1.231		

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev

VISUAL ESTIMATION RESULTS

Estimated Parameters

Parameter	Estimate	
K	0.0006018	ft/min
y0	1.752	ft

APPENDIX F

RBCA CALCULATIONS

IN-SITU SOIL RISK EVALUATION

SOUTH CAROLINA
Department of Health and Environmental Control (DHEC)

Site Data

SITE ID #		COUNTY	Columbia
FACILITY NAME	Site 4, Building 640		
STREET ADDRESS	Charleston Naval Complex, North Charleston, SC		

Soil Risk Evaluation Data

					Figure
TPH		1890	mg/kg		
Soil % SAND (Estimated)		86	%		
Soil % CLAY (Estimated)		6	%		
Worst Case	Benzene	0.9	mg/kg	Cs	
Soil Analyses	Toluene		mg/kg	Cs	
	Ethylbenzene		mg/kg	Cs	
	Xylenes		mg/kg	Cs	
	Naphthalene	7.25	mg/kg	Cs	
	MTBE		mg/kg	Cs	
Natural Organic Carbon Content		8195	mg/kg	foc	
Average Annual Recharge		25	cm	Hw	
Distance from highest Soil Impact to water table		31	cm	L	
Bulk Density of Soil		1.7	g/cc	Bd	1
Wetting Front Suction		-10	cm	Hf	2
Soil Hydraulic Conductivity		5.60E-03	cm/sec	Kf	3
Porosity		0.45	decimal %	Φ	4
Residual Water Content		0.04	decimal %	Wr	5

List possible human exposure pathways from surface soil.
Soil leaching to groundwater - off-site ingestion or irrigational use of shallow groundwater.

IN-SITU SOIL RISK EVALUATION

SOIL LEACHABILITY MODEL FOR BENZENE

RISK-BASED CORRECTIVE ACTION FOR PETROLEUM RELEASES

SITE INFORMATION:

Site: [redacted]

Location: [redacted]

REFERENCES:

(1) SCDHEC, RBCA For Petroleum Releases, June 1995, Appendix B, Figure 1.
(2) SCDHEC, RBCA For Petroleum Releases, June 1995, Appendix B, Table 2.
(3) SCDHEC, RBCA For Petroleum Releases, June 1995, Appendix B, Input Parameters.
(4) SCDHEC, RBCA For Petroleum Releases, June 1995, Appendix B, Table 1.
(5) SCDHEC, RBCA For Petroleum Releases, June 1995, Appendix B, Figure 2.
(6) SCDHEC, RBCA For Petroleum Releases, June 1995, Appendix B, Figure 3.
(7) SCDHEC, RBCA For Petroleum Releases, June 1995, Appendix B, Figure 4.
(8) SCDHEC, RBCA For Petroleum Releases, June 1995, Appendix B, Figure 5.

INPUT:

COC	Chemical of Concern		BENZENE
Bd	Soil Bulk Density (1)	g/cm3	1.7
Crsbl	Risk Based Screening Level	mg/L	0.15
Cs	Concentration of COC in soil	mg/kg	0.9
DAF	Dilution/Attenuation Factor (2)	unitless	8
foc	Organic Carbon Content in Soil (3)	mg/kg	8195
H'	Henry's Law Constant (4)	unitless	0.23
Hf	Wetting front suction head (always negative) (5)	cm	-10
Hw	Average Annual Recharge (3)	cm	25.00
Kf	Soil Hydraulic Conductivity (6)	cm/s	5.60E-03
Koc	Soil/Water Partioning Coefficient (2)	ml/g	81
L	Depth between soil sample with greatest COC concentration to groundwater.	cm	31
Φ	Porosity (7)	unitless	0.45
t1/2	Biodegradation "half life" (2)	days	16
TPH	Total Petroleum Hydrocarbons, EPA Method 3550	mg/kg	1890
Wr	Residual Water Content (8)	volume fraction	0.04

CALCULATIONS:

Equation Set I - Determine soil pore water concentration resulting from physical partioning (Cw).

Step 1 - Calculate the total organic carbon content (fcs) of the soil.

fcs = (foc +TPH/1.724)*1E-6 = **0.0093** decimal %

Step 2 - Calculate the concentration of COC in soil pore water (Cw) directly in contact with the contaminate soil.

Cw = Cs*((Wr *1g/cc+Bd)/((Bd*Koc*fcs)+Wr+((ø-Wr)*H'))) = **1.1090** mg/l

Equation Set II - Determine the velocity of the soil pore water (Vw)

Step 1 - Calculate the air filled porosity (f) in decimal percent.

f = Ø - Wr = **0.41** decimal %

Step 2 - Determine the time for water to percolate through the vadose zone soil (from depth of worst case soil sample to the water table at site).

t = (f/Kf)*(L-((Hw-Hf)*(ln((Hw+L-Hf)/(Hw-Hf))))) = **627** seconds

Step 3 - Determine the velocity of the water (Vw) in feet per year.

Vw = (L/30.48cm/ft)/(t/31,500,000sec/year) = **50,263** ft/year

Equation Set III - Determine the organic retardation effect (Vc) of the contaminant.

Step 1 - Calculate the soil/water distribution coefficient (Kd) (ml/g) for uncontaminated soil.

Kd = Koc*foc*1E-6 = **0.663795** ml/g

Step 2 - Calculate the retardation effect of natural soil organic matter on COC migration.

Vc = Vw/(1+((Bd*Kd)/ø)) = **14,330** ft/year

Equation Set IV - Determine biodegradation rates and provide final COC concentration (Cf) at depth of concern.

Step 1 - Calculate the time (Tc) in days required for the COC to reach groundwater.

Tc = 365 day/yr*((L/30.48cm/ft)/Vc) = **0.03** days

Step 2 - Calculate estimated concentration of COC in the soil pore water (Cp) necessary to protect groundwater.

Cp = 10^(log (Crsbl)+((Tc/2.3)*(0.693/t1/2))) = **0.1502** mg/l

COC concentration in soil pore water (Cw) is less than concentration necessary to protect groundwater (Cp). Not necessary to calculate SSTL

Equation Set V - Calculate the Site Specific Target Level (SSTL) for the COC in soil.

Csstl for BENZENE in soil = Cp*DAF*(((Bd*Koc*fcs)+Wr+(F*"H'"))/(Wr*1g/cc+Bd)) = **0.974917 mg/kg**

PREPARED BY:________________________ **Date**

CHECKED BY:________________________ **Date**

IN-SITU SOIL RISK EVALUATION

SOUTH CAROLINA
Department of Health and Environmental Control (DHEC)

Site Data

SITE ID # 0
FACILITY NAME Site 4, Building 640

Instructions

Provide results, separately, for each constituent in the worst case soil analysis.

Data

List Constituent: BENZENE
(BTEX, Napth.)

				Table
Bioremediation "half-life"	16	days	t 1/2	1
Soil/water partitioning coefficient	81	ml/g	K oc	1

Results

				Equation Set	Step
Total Organic Carbon Content	0.0093	decimal %	f cs	I	1
.eachate Concentration	1.109	mg/l	C w	I	2
Air Filled Porosity	0.41	decimal %	f	II	1
Infiltration Rate Time	627	seconds	t	II	2
Velocity of Water	50,263	ft/year	V w	II	3
Soil/Water Distribution Coefficient	0.6638	ml/g	K d	III	1
Contaminant Percolation Rate	14,330	ft/year	V c	III	2
Time to Reach Groundwater	0.03	days	T c	IV	1
Concentration reaching Groundwater	0.1502	mg/l	C p	IV	2
Site Specific Target Level	**0.975**	mg/kg	C sstl	V	

Conclusions

Does concentration of chemical of concern in soil exceed SSTL? NO

Risk of Human Exposure due to contaminated soil.
________ **YES** X ________ **NO**

IN-SITU SOIL RISK EVALUATION

SOIL LEACHABILITY MODEL FOR NAPHTHALENE

RISK-BASED CORRECTIVE ACTION FOR PETROLEUM RELEASES

SITE INFORMATION:

Site:	Site 4, Building 640
Location:	Charleston Naval Complex, North Charleston, SC

REFERENCES:

(1) SCDHEC, RBCA For Petroleum Releases, June 1995, Appendix B, Figure 1.
(2) SCDHEC, RBCA For Petroleum Releases, June 1995, Appendix B, Table 2.
(3) SCDHEC, RBCA For Petroleum Releases, June 1995, Appendix B, Input Parameters.
(4) SCDHEC, RBCA For Petroleum Releases, June 1995, Appendix B, Table 1.
(5) SCDHEC, RBCA For Petroleum Releases, June 1995, Appendix B, Figure 2.
(6) SCDHEC, RBCA For Petroleum Releases, June 1995, Appendix B, Figure 3.
(7) SCDHEC, RBCA For Petroleum Releases, June 1995, Appendix B, Figure 4.
(8) SCDHEC, RBCA For Petroleum Releases, June 1995, Appendix B, Figure 5.

INPUT:

COC	Chemical of Concern		NAPHTHALENE
Bd	Soil Bulk Density (1)	g/cm3	1.7
Crsbl	Risk Based Screening Level	mg/L	1.63
Cs	Concentration of COC in soil	mg/kg	7.25
DAF	Dilution/Attenuation Factor (2)	unitless	8
foc	Organic Carbon Content in Soil (3)	mg/kg	8195
H'	Henry's Law Constant (4)	unitless	0.002
Hf	Wetting front suction head (always negative) (5)	cm	-10
Hw	Average Annual Recharge (3)	cm	25
Kf	Soil Hydraulic Conductivity (6)	cm/s	0.0056
Koc	Soil/Water Partioning Coefficient (2)	ml/g	1543
L	Depth between soil sample with greatest COC concentration to groundwater.	cm	31
Ø	Porosity (7)	unitless	0.45
t1/2	Biodegradation "half life" (2)	days	48
TPH	Total Petroleum Hydrocarbons, EPA Method 3550	mg/kg	1890
Wr	Residual Water Content (8)	volume fraction	0.04

CALCULATIONS:

Equation Set I - Determine soil pore water concentration resulting from physical partioning (Cw).

Step 1 - Calculate the total organic carbon content (fcs) of the soil.

fcs = (foc +TPH/1.724)*1E-6 = 0.0093 decimal %

Step 2 - Calculate the concentration of COC in soil pore water (Cw) directly in contact with the contaminate soil.

Cw = Cs*((Wr *1g/cc+Bd)/((Bd*Koc*fcs)+Wr+((ø-Wr)*H'))) = 0.02 mg/l

Equation Set II - Determine the velocity of the soil pore water (Vw)

Step 1 - Calculate the air filled porosity (f) in decimal percent.

f = ø - Wr = 0.41 decimal %

Step 2 - Determine the time for water to percolate through the vadose zone soil (from depth of worst case soil sample to the water table at site).

t = (f/Kf)*(L-(Hw-Hf))*(ln(Hw+((L-Hf)/(Hw-Hf)))) = 627 seconds

Step 3 - Determine the velocity of the water (Vw) in feet per year.

Vw = (L/30.48cm/ft)/(t/31,500,000sec/year) = 50263 ft/year

Equation Set III - Determine the organic retardation effect (Vc) of the contaminant.

Step 1 - Calculate the soil/water distribution coefficient (Kd) (ml/g) for uncontaminated soil.

Kd = Koc*foc*1E-6 = 12.644885 ml/g

Step 2 - Calculate the retardation effect of natural soil organic matter on COC migration.

Vc = Vw*(1+((Bd*Kd)/ø)) = 1,031 ft/year

Equation Set IV - Determine biodegradation rates and provide final COC concentration (Cf) at depth of concern.

Step 1 - Calculate the time (Tc) in days required for the COC to reach groundwater.

Tc = 365 day/yr*((L/30.48cm/ft)/Vc) = 0.35 days

Step 2 - Calculate estimated concentration of COC in the soil pore water (Cp) necessary to protect groundwater.

Cp = 10^(log (Crsbl)+((Tc/2.3)*(0.693/t1/2))) = 1.64 mg/l

COC concentration in soil pore water (Cp) is greater than Crsbl, therefore the SSTL must be calculated.

Equation Set V - Calculate the Site Specific Target Level (SSTL) for the COC in soil.

Csstl for APHTHALENE in soil = Cp*DAF*(((Bd*Koc*fcs)+Wr+(F*'H'"))/(Wr*1g/cc+Bd)) = 183.895211 mg/kg

PREPARED BY:____________________________

Date

CHECKED BY:____________________________

Date

IN-SITU SOIL RISK EVALUATION

SOUTH CAROLINA
Department of Health and Environmental Control (DHEC)

Site Data

SITE ID # 0
FACILITY NAME Site 4, Building 640

Instructions

Provide results, separately, for each constituent in the worst case soil analysis.

Data

List Constituent: NAPHTHALENE
(BTEX, Napth.)

				Table
Bioremediation "half-life"	48	days	t 1/2	1
Soil/water partitioning coefficient	1543	ml/g	K oc	1

Results

				Equation Set	Step
Total Organic Carbon Content	0.0093	decimal %	f cs	I	1
Leachate Concentration	0.020	mg/l	C w	I	2
Air Filled Porosity	0.41	decimal %	f	II	1
Infiltration Rate Time	627	seconds	t	II	2
Velocity of Water	50,263	ft/year	V w	II	3
Soil/Water Distribution Coefficient	12.64	ml/g	K d	III	1
Contaminant Percolation Rate	1,031	ft/year	V c	III	2
Time to Reach Groundwater	0	days	T c	IV	1
Concentration reaching Groundwater	1.64	mg/l	C p	IV	2
Site Specific Target Level	**184**	mg/kg	C sstl	V	

Conclusions

Does concentration of chemical of concern in soil exceed SSTL? NO

Risk of Human Exposure due to contaminated soil.

_______ YES X_______ NO

IN-SITU SOIL RISK EVALUATION

ZONE H, CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA
SCDHEC UST ID No. 09868

DOMENICO'S DILUTION/ATTENUATION EQUATION FOR GROUNDWATER TRANSPORT

Site-Specific Target Level Calculations for Groundwater: Potential Future Off-Site Ingestion (Cooper River)

Parameter Descriptions:	Units
POE = Point of Exposure	
SSTL = Site-Specific Target Level	mg/L
$SSTL_{SOURCE}$ = Hydrocarbon Concentration in Plume Source Area protective of RBSLs at POE	mg/L
$SSTL_{COMP}$ = Hydrocarbon Concentration at Compliance Point protective of RBSLs at POE	mg/L
X_{POE} = x = Distance from Plume Source to POE (along Centerline)	m
X_{COMP} = x = Distance from POE to Compliance Point (along Centerline)	m
Y = Source Width (Perpendicular to Flow Direction)	m
Z = Source Depth (Perpendicular to Flow Direction in Vertical Plane)	m
K_s = Saturated Hydraulic Conductivity	m/sec
I = Groundwater Gradient	cm/cm
θ = Porosity in Saturated Zone	cm^3/cm^3

Parameter Descriptions:	Units
ρ_s = Soil Bulk Density	g/cm^3
f_{OC} = Fraction Organic Carbon in Soil	g-C/g-soil
α_X = Longitudinal Dispersivity = 0.2x	m
α_Y = Transverse Dispersivity = $\alpha_X/300$	m
α_Z = Vertical Dispersivity = 1×10^{-99}	m
k_{OC} = Organic Carbon Partition Coefficient	cm^3-H_2O/g-C
k_D = Soil-Water Sorption Coefficient	cm^3-H_2O/g-soil
V = Pore Water Velocity	m/sec
R_C = Constituent Retardation Factor	
V/R_C = Maximum Transport Rate of Dissolved Constituent = $(K_s I)/(\theta R_C)$	m/sec
RBSL = Risk-Based Screening Level in Water Provided by SCDHEC (1998)	mg/L

Dilution & Attenuation without Biological Decay

Constituent	X_{POE}	X_{POE}	Y	Z	t	K_s	i	θ	ρ_s	α_X	α_Y	α_Z	f_{OC}	k_{OC}	k_D	V	R_C	C_{POE}/C_{SOURCE}
	ft	m	m	m	sec	m/sec	m/m	cm^3/cm^3	g/cm^3	m	m	m	g-C/g-soil	cm^3-H_2O/g-C	cm^3-H_2O/g-so	m/sec		
Benzene	200	60.9607	15	2	1.00E+13	1.34E-05	0.0080	0.43	1.54	6.10	2.03	0.30	8.20E-03	81	0.6642	2.49E-07	3.379	9.419E-02
Toluene	200	60.9607	15	2	1.00E+13	1.34E-05	0.0080	0.43	1.54	6.10	2.03	0.30	8.20E-03	133	1.0906	2.49E-07	4.906	9.419E-02
Naphthalene	200	60.9607	15	2	1.00E+13	1.34E-05	0.0080	0.43	1.54	6.10	2.03	0.30	8.20E-03	1543	12.6526	2.49E-07	46.314	9.419E-02

Constituent	X_{COMP}	X_{COMP}	Y	Z	t	K_s	i	θ	ρ_s	α_X	α_Y	α_Z	f_{OC}	k_{OC}	k_D	V	R_C	C_{POE}/C_{COMP}
	ft	m	m	m	sec	m/sec	m/m	cm^3/cm^3	g/cm^3	m	m	m	g-C/g-soil	cm^3-H_2O/g-C	cm^3-H_2O/g-so	m/sec		
Benzene	150	45.7206	15	2	1.00E+12	1.34E-05	0.008	0.43	1.54	4.57	1.52	0.23	8.20E-03	81	0.6642	2.49E-07	3.379	1.606E-01
Toluene	150	45.7206	15	2	1.00E+13	1.34E-05	0.008	0.43	1.54	4.57	1.52	0.23	8.20E-03	133	1.0906	2.49E-07	4.906	1.606E-01
Naphthalene	150	45.7206	15	2	1.00E+13	1.34E-05	0.008	0.43	1.54	4.57	1.52	0.23	8.20E-03	1543	12.6526	2.49E-07	46.314	1.606E-01

Source: South Carolina Department of Health and Environmental Control (SCDHEC) 1998. *Risk-Based Corrective Action for Petroleum Releases*, Bureau of Underground Storage Tank Management.

DOMENICO DILUTION/ATTENUATION MODEL WITHOUT BIOLOGICAL DECAY

$$\frac{C_X}{C_{SOURCE}} = \frac{1}{2} erfc\left[\frac{\left(x - \frac{vt}{R_c}\right)}{2\sqrt{\alpha_X \frac{vt}{R_c}}}\right] \times erf\left[\frac{Y}{4\sqrt{\alpha_Y x}}\right] \times erf\left[\frac{Z}{2\sqrt{\alpha_Z x}}\right]$$

Constituent	POE RBSL	$SSTL_{SOURCE}$	$SSTL_{COMP}$
	mg/L	mg/L	mg/L
Benzene	0.005	0.053	0.031
Toluene	1.000	10.617	6.228
Naphthalene	0.010	0.106	0.062

ZONE H, CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

DOMENICO'S DILUTION/ATTENUATION EQUATION FOR GROUNDWATER TRANSPORT

Predicted 10-year Migration of Constituents in Groundwater

Parameter Descriptions:	Units
POE = Point of Exposure	
SSTL = Site-Specific Target Level	mg/L
$SSTL_{SOURCE}$ = Hydrocarbon Concentration in Plume Source Area protective of RBSLs at POE	mg/L
$SSTL_{COMP}$ = Hydrocarbon Concentration at Compliance Point protective of RBSLs at POE	mg/L
X_{POE} = x = Distance from Plume Source to POE (along Centerline)	m
X_{COMP} = x = Distance from POE to Compliance Point (along Centerline)	m
Y = Source Width (Perpendicular to Flow Direction)	m
Z = Source Depth (Perpendicular to Flow Direction in Vertical Plane)	m
K_s = Saturated Hydraulic Conductivity	m/sec
i = Groundwater Gradient	cm/cm
θ = Porosity in Saturated Zone	cm^3/cm^3

Parameter Descriptions:	Units
ρ_s = Soil Bulk Density	g/cm^3
f_{oc} = Fraction Organic Carbon in Soil	g-C/g-soil
α_x = Longitudinal Dispersivity = x/10	m
α_Y = Transverse Dispersivity = $\alpha_x/3$	m
α_z = Vertical Dispersivity = $\alpha_x/20$	m
k_{oc} = Organic Carbon Partition Coefficient	cm^3-H_2O/g-C
k_D = Soil-Water Sorption Coefficient	cm^3-H_2O/g-soil
V = Pore Water Velocity	m/sec
R_C = Constituent Retardation Factor	
V/R_C = Maximum Transport Rate of Dissolved Constituent = $(K_s i)/(\theta R_C)$	m/sec
RBSL = Risk-Based Screening Level in Water Provided by SCDHEC (1998)	mg/L

Dilution & Attenuation without Biological Decay

Constituent	X_{POE} ft	X_{POE} m	Y m	Z m	t sec	K_S m/sec	i m/m	θ m^3/cm	ρ_S g/cm^3	α_X m	α_Y m	α_Z m	f_{OC} g-C/g-soil	k_{OC} cm^3-H_2O/g-C	k_D cm^3-H_2O/g-soil	V m/sec	R_C	C_{POE}/C_{SOURCE}
Benzene	140	42.6725	15	2	3.15E+08	1.34E-05	0.0080	0.43	1.54	4.27	1.42	0.21	8.20E-03	81	0.6642	2.49E-07	3.379	1.532E-02
Toluene	63	19.2026	15	2	3.15E+08	1.34E-05	0.0080	0.43	1.54	1.92	0.64	0.10	8.20E-03	133	1.0906	2.49E-07	4.906	2.094E-01
Naphthalene	22.2	6.76664	15	2	3.15E+08	1.34E-05	0.0080	0.43	1.54	0.68	0.23	0.03	8.20E-03	1543	12.6526	2.49E-07	48.314	4.110E-04

Source: South Carolina Department of Health and Environmental Control (SCDHEC) 1998. *Risk-Based Corrective Action for Petroleum Releases*, Bureau of Underground Storage Tank Management.

DOMENICO DILUTION/ATTENUATION MODEL WITHOUT BIOLOGICAL DECAY

$$\frac{C_X}{C_{SOURCE}} = \frac{1}{2} erfc\left[\frac{\left(x - \frac{vt}{R_C}\right)}{2\sqrt{\alpha_X \frac{vt}{R_C}}}\right] \times erf\left[\frac{Y}{4\sqrt{\alpha_Y x}}\right] \times erf\left[\frac{Z}{2\sqrt{\alpha_Z x}}\right]$$

Constituent	C_{SOURCE} mg/L	C_X mg/L
Benzene	0.313	0.005
Toluene	4.646	0.973
Naphthalene	23.346	0.010

Prepared By: ______________________

Reviewed By: ______________________

ZONE H, CHARLESTON NAVAL COMPLEX
NORTH CHARLESTON, SOUTH CAROLINA

DOMENICO'S DILUTION/ATTENUATION EQUATION FOR GROUNDWATER TRANSPORT

Predicted 20-year Migration of Constituents in Groundwater

Parameter Descriptions:	Units
POE = Point of Exposure	
SSTL = Site-Specific Target Level	mg/L
$SSTL_{SOURCE}$ = Hydrocarbon Concentration in Plume Source Area protective of RBSLs at POE	mg/L
$SSTL_{COMP}$ = Hydrocarbon Concentration at Compliance Point protective of RBSLs at POE	mg/L
X_{POE} = x = Distance from Plume Source to POE (along Centerline)	m
X_{COMP} = x = Distance from POE to Compliance Point (along Centerline)	m
Y = Source Width (Perpendicular to Flow Direction)	m
Z = Source Depth (Perpendicular to Flow Direction in Vertical Plane)	m
K_s = Saturated Hydraulic Conductivity	m/sec
i = Groundwater Gradient	cm/cm
θ = Porosity in Saturated Zone	cm^3/cm^3

Parameter Descriptions:	Units
ρ_s = Soil Bulk Density	g/cm^3
f_{oc} = Fraction Organic Carbon in Soil	g-C/g-soil
α_x = Longitudinal Dispersivity = x/10	m
α_y = Transverse Dispersivity = $\alpha_x/3$	m
α_z = Vertical Dispersivity = $\alpha_x/20$	m
k_{oc} = Organic Carbon Partition Coefficient	cm^3-H_2O/g-C
k_D = Soil-Water Sorption Coefficient	cm^3-H_2O/g-soil
V = Pore Water Velocity	m/sec
R_c = Constituent Retardation Factor	
V/R_c = Maximum Transport Rate of Dissolved Constituent = $(K_s i)/(\theta R_c)$	m/sec
RBSL = Risk-Based Screening Level in Water Provided by SCDHEC (1998)	mg/L

Dilution & Attenuation without Biological Decay

Constituent	X_{POE} ft	X_{POE} m	Y m	Z m	t sec	K_S m/sec	i m/m	θ m^3/cm^3	ρ_s g/cm^3	α_X m	α_Y m	α_Z m	f_{OC} g-C/g-soil	k_{OC} cm^3-H_2O/g-C	k_D cm^3-H_2O/g-soil	V m/sec	R_C	C_{POE}/C_{SOURCE}
Benzene	220	67.0568	15	2	6.31E+08	1.34E-05	0.0080	0.43	1.54	6.71	2.24	0.34	8.20E-03	81	0.6642	2.49E-07	3.379	1.617E-02
Toluene	94	28.6515	15	2	6.31E+08	1.34E-05	0.0080	0.43	1.54	2.87	0.96	0.14	8.20E-03	133	1.0906	2.49E-07	4.906	2.126E-01
Naphthalene	43.4	13.2285	15	2	6.31E+08	1.34E-05	0.0080	0.43	1.54	1.32	0.44	0.07	8.20E-03	1543	12.6526	2.49E-07	46.314	4.370E-04

Source: South Carolina Department of Health and Environmental Control (SCDHEC) 1998. *Risk-Based Corrective Action for Petroleum Releases*, Bureau of Underground Storage Tank Management.

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